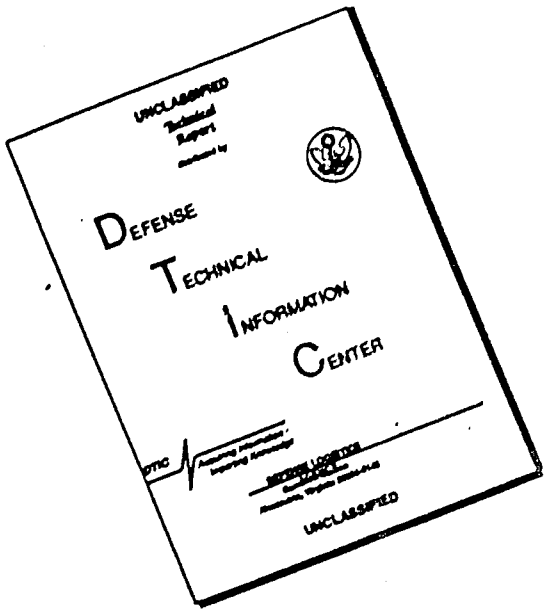
APPLICATION of AUTOMATIC DATA PROCESSING SYSTEMS to FIELD ARTILLERY TECHNICAL FIRE CONTROL INPUT/OUTPUT DATA

USAAMS STUDY 59-9

15 March 1959

DISCLAIMER NOTICE



THIS DOCUMENT IS BEST QUALITY AVAILABLE. THE COPY FURNISHED TO DTIC CONTAINED A SIGNIFICANT NUMBER OF PAGES WHICH DO NOT REPRODUCE LEGIBLY.

TABLE OF CONTENTS

I. GENERAL DISCUSSION.

1. SYSTEM AND STUDY DEFINITION.

a. This study considers field artillery technical fire control input and output data. Inputs and outputs necessary for solution of the technical fire control problem and the flow of these data are considered at battery, battalion, division artillery, group, corps and army artillery.

b. This study does not consider the computational scheme for the ballistic solution of the technical fire control problem as this is dictated by the technical requirements of each weapon and will be completed before placing the weapon computer in the computer net.

2. GENERAL ASSUMPTIONS.

a. Any change in operational structure and environment of the field army including tactics, doctrine and techniques, envisioned for the present as well as the future, will not materially affect the requirements as to type and amount of input and output data required for solution of the technical fire control problem.

b. Computers possessing the characteristics of computers in the field data family will be available.

c. Weapon systems computers possessing the characteristics of FADAC (Field Artillery Digital Automatic Computer) will be available and will be able to communicate (receive and transmit data) with computers of the field data family.

d. A digital long-range communication system will be available and be capable of being superimposed upon current or envisioned standard, tactical communications systems.

e. The ADPS concept will not be restricted by the present state of development of ADPS equipments. Any conceptual requirement is capable of technological attainment in the time frame of this study.

3. SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS.

a. Conclusions (for detailed conclusions see paragraph 12, Section VI of this study):

(1) Weapon system computers offer the ultimate solution to the field artillery technical fire control problem.

(2) Weapon system computers will have the capability of working in the ADPS network.

(3) A complete ADPS - weapon system computer network should be established.

(4) This system must have a backup system in case of failure.

(5) A test application of ADPS to artillery fire control, as opposed to the use of weapon system computers without communication linkage to an ADPS will be required before a realistic evaluation of ADPS can be made.

b. Recommendations (for detailed recommendations see paragraph 13, Section VI of this study):

(1) Approval of this study and its findings.

(2) Action by the appropriate agencies:

(a) To provide the data transmission and storage capability visualized for the integrated ADPS - weapon system computer network.

(b) To coordinate further efforts in this field with the USAA&MS by means of a small working group.

II. DISCUSSION OF PRESENT SYSTEM

4. ASSUMPTIONS PERTAINING TO PRESENT SYSTEM.

a. A type field army is assumed. This consists of three corps each having three infantry divisions and one armored division. The type corps and army artillery used is the 1958 Revised Type Corps and Army Artillery whose major elements for the purpose of this study are:

(1) Army Artillery.

(a) One Hq & Hq Btry, Army Arty.

(b) One Hq & Hq Btry, FA Msl Gp (Hvy).

(c) One 280mm Gun Bn.

(d) One Msl Bn Redstone or Pershing.

(2) Corps Artillery.

(a) One Hq & Hq Btry, Corps Arty.

(b) Four Hq & Hq Btry, FA Group.

(c) Seventeen Cannon battalions.

(d) Three 762mm Rkt Bn's (HJ).

(e) One Msl Bn Corporal or Sgt.

(3) Infantry Division Artillery.

(a) One 105mm How Bn's.

(b) One Composite Bn.

(c) Five 4.2 inch mortar btrys.

(4) Armoured Division Artillery.

(a) Three 105mm How Bn's.

(b) One Composite Bn.

b. For the purpose of this study division artillery units will move a maximum of once every 24-hours; heavy and very heavy non-divisional artillery units once every 48-hours.

c. Only the communication capabilities now present in artillery units will be considered.

d. Atomic weapons will be used by artillery units having atomic capabilities.

e. Sufficient atomic, special and non-atomic ammunition will be stockpiled for immediate use.

f. Target acquisition capabilities will be adequate to provide target information for all types of artillery units.

5. NARRATIVE DESCRIPTION OF PRESENT SYSTEM.

a. The principal characteristics and capabilities of field artillery are:

(1) Destructive power obtained through accurate and timely delivery of atomic fires or masses of non-atomic fires, regardless of visibility, weather, and terrain, in a very short period of time. 58.3

(2) Versatility through rapid maneuver of atomic and non-atomic fires over a wide front from widely dispersed positions without a change in position areas.

(3) Mobility, which permits the commander to displace his artillery quickly while providing continuous fire support.

(4) Demoralizing effect on enemy ground forces by fires delivered from positions some distance from the point of contact, thereby limiting their ability to strike back or to locate the source of their casualties.

b. In the application of gunnery, the ultimate objective is to insure that the field artillery carries out effectively its two principle missions:

(1) To give close support to other arms by fire, neutralizing or destroying those targets which are most dangerous to the supported arms.

(2) To give depth to combat and isolate the battlefield by counterfire, fire on hostile reserves, restricting movement in rear areas, and disrupting hostile command facilities and other installations.

c. The basic principles of employment of field artillery fire power are:

(1) Field artillery doctrine demands the timely and accurate delivery of fire to meet the requirements of supported troops. All members of the artillery team must be continuously indoctrinated with the sense of urgency, striving to reduce by all possible measures the time required to execute an effective fire mission.

(2) To be effective, artillery fire of suitable density must hit the target at the proper time and with the appropriate projectile and fuze.

(3) Good observation permits the delivery of more effective fire. Limited observation results in a greater expenditure of ammunition and reduces the effectiveness of fire. Some type of observation is desirable for close in targets fired upon in order to insure that fire is placed on the target. Observation of close-in battle areas is usually visual; when targets are hidden by terrain features or when greater distances of limited visibility are involved, observation may be either visual (air or flash) or electronic (radar or sound). When observation is available, corrections can be made to place non-atomic fires on target by adjustment procedures; however, lack of observation must not preclude firing on targets that can be located by other means. For targets that cannot be observed, effective fire must be delivered by unobserved fire procedures.

(4) Field artillery fires must be delivered by the most accurate means which time and the tactical situation permit. Whenever possible, survey will be used to locate the weapons and targets accurately. Under other conditions, only a rapid estimate of the relative location of weapons and targets may be possible. However, survey of all installations should be as complete as time permits in order to achieve the most effective massed fires. Inaccurate fire wastes ammunition and weakens the confidence of supported troops in the artillery.

(5) In order to inflict a maximum number of casualties, the immediate objective is to deliver accurate atomic and massed non-atomic fires. The number of casualties inflicted in a specific target area can be increased in most instances by surprise fire. If surprise massed fires cannot be achieved, the time required to bring effective fire to bear on the target should be reduced to a minimum.

(6) The greatest demoralizing effect on the enemy can be achieved by delivery of a maximum number of rounds from many pieces in the shortest possible time and without adjustment. Accurate massed non-atomic fire with one round per weapon from six batteries will be much more effective than six rounds per weapon from one battery, provided that they arrive on the target simultaneously.

(7). Artillery units must be prepared to handle multiple fire missions when the situation so dictates.

d. The following discussion will not deal with technical fire control computational techniques (the mathematics of a ballistic solution), except as necessary to acquaint the reader with the overall problem. The discussion will cover all other parameters of the problem emphasis being placed on input and output requirements for successful and effective delivery of fire.

e. The artillery fire problem may be thought of as being composed of three aspects; namely, the geometric, the ballistic, and the mechanical aspect. The geometric aspect requires determination of the relative location of weapon and desired burst point in a common three-dimensional reference system. The ballistic aspect requires measurement of and precise corrections for existing conditions of the weapon - weather - ammunition combination and results in corrected firing data. The mechanical aspect includes the actions of missile and gun crews to effect the computed trajectory.

f. The present procedures for Field Artillery Fire Control throughout the Field Army can generally be considered in three broad categories.

(1) Procedures used for weapons whose trajectory cannot be altered, by external or internal devices, after firing, i.e., mortars and cannons.

(2) Procedures used for free flight rockets. These procedures are very similar to cannon artillery, but since the inputs and outputs required are in some cases different, especially as to format, these weapons are treated as a separate section.

(3) Procedures used for weapons whose trajectory or flight path may be altered by external or internal devices after firing, i.e., guided missiles.

g. Mortars and cannons.

(1) These weapons are normally emplaced in defilade so they cannot be seen or easily located by the enemy. Since this measure precludes sighting the weapons directly at most targets (direct fire), another method of pointing the weapon called indirect fire is used. The use of indirect fire requires the coordinated efforts of the field artillery gunnery team which includes observers, fire direction centers (FDCs), and weapons crews. These elements are interconnected by wire and/or radio communications.

(a) Observers detect and report the locations of suitable targets to the FDC and request fire. The observers are so located that collectively they have surveillance of the zone of action.

(b) Fire direction centers exercise tactical and technical fire control. The lower echelon FDC's determine firing data and furnish fire commands to the weapons crews of firing units.

(c) Weapons' crews apply the fire command data to the pieces for pointing (laying) and firing.

(2) Input is a fire request from an observer or a fire order from higher headquarters requesting fire on a specified location. These locations are obtained by observation (visual or electronic), map or photographic analysis or other means.

(3) The fire direction officer must consider certain factors when attacking a target. Basically, these factors are nature and size of the target, ammunition available, results desired, safety of our own troops and time available. The nature of the target includes type, mobility, cover, and importance. It is considered carefully to determine the proper type of projectile, fuze, caliber of weapon, and necessary ammunition expenditure. The nature of the target is also a guiding factor in determining the delivery technique to be used and the speed of attack. As weapons analysis and artillery capabilities computations are subjects of separate ADPG studies, these facets of the Fire Control Problem will not be discussed within this study (manual or proposed systems) except as necessary to understand the present manual system.

(4) The information necessary to prepare artillery weapons for a fire mission is termed firing data and includes direction, distribution, vertical interval, and range. These data may be obtained by computations, estimation, or graphical means.

(a) Artillery fire can be considered under the two broad categories of observed (adjusted) and unobserved (unadjusted) fire.

1. Observed fire can be observed or adjusted to the target. Adjustment is a system of trial firing to determine the firing data necessary to deliver effective fire on a selected point. The selected point is called the adjusting point and may be the target, a portion of the target, or some well-defined point in the target area. Observed fires may be necessitated by deficiencies in knowledge of either the geometric phase or the ballistic phase of the total gunnery problem, or a combination of the two. The adjusted data in itself does not differentiate between the two phases. Lack of accuracy in location may be the result of poor visibility, deceptive terrain, poor maps, or difficulty on the part of the observer in pinpointing the target. If a current registration of the pieces has not been accomplished, adjustment may be accomplished regardless of the accuracy of target location. Adjustments will be of three types: precision registrations, destruction, and area missions.

2. Unobserved fire is used when fire cannot be observed to the target. The FDC personnel use known corrections to derive fire commands which will provide the most effective fire possible. When unobserved fire is necessary, the area taken under attack should be increased to improve the probability that the target is included with the area covered. If possible, registration always should be accomplished and appropriate corrections applied to firing data. In the absence of specific corrections for each battalion, the corrections determined by registration of one battalion may be used by other battalions equipped with like weapons. The provisions below are prerequisites for unobserved fire when only one battalion registers. Lack of any of these provisions may seriously reduce the effectiveness of unobserved fires.

a. The battalions are connected by survey.

b. The battalions are not widely separated laterally or in depth.

c. Calibration data for the battalions are known and used.

d. The same ammunition lot is used by all battalions.

e. Current met and velocity error corrections are known and applied.

(b) Generally, there are four different delivery techniques used to solve the ballistic aspect of the fire control problem. The four techniques are:

1. K-transfer. Corrections for non-standard conditions are determined by firing. A factor is determined to be applied to actual range to a point to determine the range which must be fired to hit that point. The factor is the result of registration and/or the solution of a meteorological message. It is expressed as a (K) of plus or minus so many units per thousand units of actual range. Fire can then be shifted from one point to another within the transfer limits of the pieces, the range being corrected by application of the range, (K). Correction for direction (deflection) is determined by firing and modified as necessary by the drift correction which is dependent on the range fired.

2. Met + VE. To determine the VE range effect, met conditions must be measured concurrently with a registration. The met range effects are subtracted from the total effect determined from the registration. The remainder is assumed to be the range effect of VE.

3. Met + VE Transfer. This technique is a combination of the Met plus VE and the K-Transfer methods. A VE is determined as in the Met plus VE technique. On subsequent firings this VE and a current met message are used to determine a theoretical range effect. This effect is then used for the determination of a K to be applied as in the K-Transfer technique.

4. Predicted fire. Predicted fire is the delivery of artillery fire on a target of known location without benefit of prior registration and without regard to range transfer limitations. This type of fire requires accurately computed firing data for a specific target, corrected for all non-standard conditions of weather, materiel, ammunition, and rotation of the earth. In predicted fire, it is assumed that survey, electronic met message, and muzzle velocity variation measurements are accurate and that accurate ballistic performance data is available for the gun, propellant, projectile, and fuze.

(5) The fire direction center (FDC) is an element of the command post. It consists of gunnery and communication personnel and equipment by means of which fire direction and/or fire control is exercised. FDC personnel convert target intelligence, fire missions of higher commanders, and fire requests into appropriate fire commands. They also transmit these commands to the weapon(s). (Division artillery, artillery group and higher headquarters FDC's normally do not produce fire commands. They do not transmit commands directly to the weapons.)

(a) The Field Artillery Battery FDC.

1. Mission of the battery FDC is to provide fire commands to the pieces. Operations consist of the following:

a. Construction of firing charts.

b. Production of firing data necessary to lay the pieces for direction and elevation.

c. Computation and application of corrections including met data and velocity error.

2. FDC Organization. The FDC is organized to permit efficient division of duties among personnel so that fire missions can be processed rapidly and accurately on a 24-hour basis.

a. The battery FDC consists of:

(1) FDO (Fire Direction Officer). - The FDO is the officer in charge of the battery FDC at any given time. All officers in the battery should be capable of functioning as the FDO.

(2) Chief Computer. The chief computer is normally the senior noncommissioned officer in the FDC and must be thoroughly proficient in communication and gunnery procedures. The chief computer is not authorized in all artillery battery TOE's.

(3) Chart Operators. - Chart operators working in the capacity as control, primary or check chart operators have basic functions in constructing and maintaining firing charts and determining firing data.

(4) Battery Computer. The computer in the battery FDC performs computations indicated by the nature of the fire mission and maintains records.

(5) Radio and Telephone Operators. - Radio and telephone operators answer calls and record data as required. The number of radio and telephone operators employed in the FDC will depend on the communication facilities installed.

b. The battery FDC personnel control the fires of the battery under the supervision of the battery FDO. When control is decentralized to the battery, the battery FDO issues the fire order.

c. The battery FDC personnel plot the target and convert the fire request and fire order into appropriate commands for transmission to the pieces.

3. Division of responsibilities within FDC.

a. Fire Direction Officer (FDO) -

(1) Actively supervises the FDC to insure accurate and timely delivery of fire.

(2) Inspects the plot of each reported target and issues the fire order.

(3) Conducts registrations and other type fires when required.

(4) Maintains appropriate records and submits necessary reports.

b. Chief Computer. (When not authorized these duties are performed by the senior enlisted man in the FDC).

(1) Supervises all enlisted members of the FDC and assists in computations.

(2) Maintains records reflecting ammunition supply and expenditures.

c. Control Chart Operator.

(1) Maintains a firing chart (battle map) called the control chart.

(2) Maintains a fire capabilities overlay and a situation overlay.

(3) Plots targets and announces altitude of the targets.

(4) Replots targets after adjustment.

d. Primary and Check Chart Operator. -

(1) The primary chart operator and the check chart operator function as a team. Both operators perform identical duties in the construction and maintenance of firing charts and the determination of firing and replot data. The difference between their functions is that the primary chart operator announces data and the check chart operator announces agreement or disagreement with the announced data. The check chart operator is not authorized in all artillery battery TOE's, but such a deletion does not affect the duties listed below.

(2) Announces range and 100/R factor to the computer.

(3) Determines the following elements of data.

(a) Deflection Correction.

(b) Chart deflection.

(c) Site.

(d) Fuze setting (when applicable.)

(e) Elevation.

(f) Charge and drift in high-angle fire.

(4) Determines adjusted coordinates for those targets to be replotted.

e. Battery Computer.

(1) Records fire requests, fire orders, firing data, corrections, and other data which the FDO directs be recorded.

(2) Computes and announces total deflection, (i.e., chart deflection plus deflection corrections), if necessary.

(3) Combines the announced site with the HB/R (height of burst over range) factor, and computes changes in site during the adjustment of time fire.

(4) Combines the announced site with the announced elevation to determine quadrant elevation when required.

(5) Computes met, VE, and special corrections.

(6) Transmits the executive officer's report to the battalion FDC when applicable.

(7) Assists in the conduct of registrations and determination of registration corrections.

f. Radio telephone operators - Must be trained in both communication and FDC procedures. Specific duties are to:

(1) Operate the radio set in FDC.

(2) Receive and record all missions transmitted by radio.

4. Flow of data to and from FDC.

a. Flow of data to battery FDC.

(1) Fire missions from air, ground observers, and battalion FDC.

(2) Fire orders.

(3) Metro message from battalion FDC or Division Artillery FDC.

(4) Data for replot.

(5) Survey data from battalion FDC.

(6) Fire commands from battalion FDC battery.

(7) Battery Data Sheet

(8) Time on Target

b. Flow of Data from battery FDC.

(1) Executive officer's report.

(2) Coordinates, description and effects of all targets fired are sent to battalion FDC.

(3) Fire for effect coordinates and altitude are sent to battalion FDC when applicable.

(4) Data for replot is sent to battalion FDC.

(b) The Field Artillery Battalion FDC.

1. The mission of the field artillery battalion FDC is to exercise tactical and technical fire control over its subordinate batteries. Firing data are normally processed in the battery FDC's and checked at either the battery or battalion FDC depending on the organization of the battalion. Operations consist of the following:

a. Construction of firing charts.

b. Production of firing data when not accomplished at the battery.

c. Computation and application of corrections.

d. Massing of fires

e. Coordination and dissemination of replot and fire for effect data.

2. FDC organization. The battalion FDC is organized under the S-3 to permit fire control of subordinate units. It consists of:

a. S-3 or assistant S-3.

b. FDO.

c. Operations sergeant.

d. Chief computer.

e. Chart operators.

f. Switchboard operator-computer.

g. Radio telephone operators.

3. Division of responsibilities within FDC:

a. The battalion S-3 is responsible for the overall operation of the FDC. The assistant S-3 must be capable of assuming the functions of the S-3.

b. Fire Direction Officer (FDO).

(1) Actively supervises the operation of the FDC.

(2) Reviews all requests for fire received at battalion.

(3) Prescribes the method of attack, the amount of ammunition to be fired on each target, and issues the fire order.

c. Operations Sergeant.

(1) Principal enlisted assistant to S-3.

(2) Maintains the situation map and prepares overlays.

(3) Assists S-3 in preparation of operation orders.

d. Chief computer.

(1) Supervises all enlisted members of the FDC.

(2) Maintains consolidated records of ammunition supply and expenditures.

(3) Informs S-2 of the status and progress of fire missions.

e. Control chart operator.

(1) Maintains a firing chart (battle map) called the control chart.

(2) Maintains a fire capabilities overlay and situation overlay.

(3) Informs the battery FDC's of changes in the friendly situation and fire capabilities of other batteries.

(4) Plots targets and announces the altitudes of the targets.

(5) Replots targets after adjustment, obtaining replot data from the adjusting battery.

f. Primary and check chart operators will not operate at the battalion FDC unless directed by the commander. Duties are the same as listed for the battery FDC.

g. Switchboard operator computer.

(1) Operates the FDC switchboard.

(2) Receives and records all missions transmitted by telephone.

(3) Repeats back fire missions by telephone for battery FDC's and the observer.

(4) Provides proper communications on the FDC switchboard for handling one or more missions as needed.

h. Radio telephone operators.

(1) Operate the radio sets in FDC.

(2) Receives and records all missions transmitted by radio.

(3) Repeats back fire missions received by radio for the battery FDC's and observer.

4. Flow of data to and from FDC.

a. Flow of data to battalion FDC.

(1) Fire missions from ground and air observers.

(2) Fire missions from higher artillery headquarters.

(3) Metro messages.

(4) Replot data from batteries.

(5) Fire for effect data from batteries.

(6) Report of targets fired on from batteries.

(7) Executive officer reports.

b. Flow of data from battalion FDC.

(1) Fire orders to the batteries.

(2) Fire commands to the batteries when battalion FDC is handling the fire mission.

(3) Fire for effect data to non-adjusting batteries when battalion is to fire for effect on a target.

(4) Metro messages to the batteries.

(5) Survey data to the batteries.

(6) Replot data to the batteries.

(7) Battery data sheet

(8) Requests for additional fires to division artillery.

(9) Fire capabilities to division artillery.

(c) The Division Artillery FDC.

1. The mission of the division artillery FDC is to control and direct the fires of the units over which they exercise tactical control. Operations consist of the following:

a. Coordinate artillery fires and integration of these fires with the fires of other fire support means.

b. Insure flexibility of artillery fires sufficient to engage all types of targets.

c. Control of artillery fires through orders, policies, and priorities and by means of adequate liaison and communication.

d. Coordinate the execution of countermortar fires.

e. Maintain a planning chart, operations chart, S-3 Journal and record of fire missions.

f. Prepare the periodic and command report.

2. FDC organization. The organization of the fire direction center is varied to meet the existing requirements and conditions. A type division artillery FDC organization consists of:

a. Division Artillery S-3.

b. Division Artillery Assistant S-3.

c. Operations Sergeant.

d. Assistant Operations Sergeant.

e. Necessary radio-telephone operators.

3. Division of responsibilities within FDC. Division of responsibilities within division artillery FDC cannot be broken down to individuals as listed in the battery and battalion FDC's. Individual tasks are based on work load and organizational SOP. The S-3 is responsible and actively supervises the operation of the FDC. The assignment of specific duties within the FDC are made by the S-3. Responsibilities include:

a. Receive and record data from artillery units and other sources pertaining to artillery fire capabilities, requests for fire, enemy and friendly information, and displacement plans.

b. Maintain an air operations map or chart to include fire capabilities, zones of fire, no-fire line, O-O line, bomb line, and atomic safety lines when appropriate and disseminate this information to lower artillery units.

c. Maintain an accurate ammunition record of the total expenditures and the amount on hand for designated artillery units.

d. Supervise the execution of artillery atomic fires.

e. Prepare countermortar plans and supervise their execution.

4. Flow of data to and from FDC.

a. Flow of data to division artillery FDC.

(1) Receives fire missions from higher artillery headquarters.

(2) Receives requests for additional fire from subordinate units.

(3) Receives fire capabilities from subordinate units.

b. Flow of data from division artillery FDC:

(1) Assigns fire missions to organic, attached, or reinforcing units.

(2) Requests for additional fire support to corps artillery FDC.

(3) Metro messages to subordinate units.

(d) The Corps Artillery FDC.

1. The corps artillery FDC operates in much the same manner as the division artillery FDC. The corps artillery FDC operates under the direct supervision of the corps artillery executive officer. Operations consist of the following:

a. Same as those shown for division artillery FDC except for countermortar fire.

b. Coordinate the execution of counterbattery fires.

2. FDC organization. The FDC is organized to permit efficient division of duties among personnel. The organization is varied to meet the existing requirements and conditions. A type corps artillery FDC organization consists of:

a. Corps Artillery Executive Officer.

b. Corps Artillery S-3.

c. Corps Artillery Assistant S-3.

d. Operations Sergeant.

e. Assistant Operations Sergeant.

3. Division of responsibilities within FDC: Individual tasks within the corps artillery FDC are based on work load and SOP. Responsibilities include:

a. Receive and record data from artillery units and other sources pertaining to artillery fire capabilities, requests for fire, enemy and friendly information, and displacement plans.

b. Maintain an operations map or chart to include fire capabilities, zones of fire, no-fire line, C-O line, bomb line, and atomic safety lines when appropriate and disseminate this information to lower units.

c. Maintain an accurate ammunition record of the total expenditures and the amount on hand for designated artillery units.

d. Supervise the execution of artillery atomic fires.

4. Flow of data to and from FDC.

a. Flow of data to corps artillery FDC:

(1) Fire missions from higher artillery headquarters.

(2) Request for additional fire.

(3) Fire capabilities of subordinate units.

b. Flow of data from corps artillery FDC:

(1) Fire missions to subordinate units.

(2) Request for additional fires.

(3) Metro messages to subordinate units.

(c) The Artillery Group FDC.

1. The field artillery group ordinarily is attached to another artillery headquarters. Hence, group FDC usually is not directly concerned with coordination with the supported unit or with target intelligence to the same degree as other echelons. When the group is operating as the artillery headquarters for a task force or similar organization, the group FDC functions similar to division artillery FDC. When distance precludes effective control of artillery units by corps artillery, the group FDC may be called on to assume certain counterbattery functions usually performed by corps artillery.

2. FDC organization. The FDC is organized to permit efficient division of duties among personnel. The organization is varied to meet the existing requirements and conditions. A type FDC organization consists of:

a. Group S-3.

b. Group Assistant S-3.

c. Operations Sergeant.

d. Assistant operations sergeant.

3. Division of responsibilities within FDC. Individual tasks are based on work load and SOP. Responsibilities include:

a. Receive and record data from artillery units and other sources pertaining to artillery fire capabilities, requests for fire, enemy and friendly information, and displacement plans.

b. Maintain an operations map or chart to include fire capabilities, zones of fire, no-fire line, O-O line, bomb line, and atomic safety lines when appropriate and disseminate this information to lower artillery units.

c. Maintain an accurate ammunition record of the total expenditures and the amount on hand for designated artillery units.

d. Coordinate counterbattery activities when directed.

4. Flow of data to and from FDC.

a. Flow of data to group FDC:

(1) Fire missions from higher artillery headquarters.

(2) Fire capabilities from subordinate units.

(3) Requests for additional fire support from subordinate units when the group is operating as the artillery headquarters for a task force.

(4) Metro messages from corps artillery FDC.

b. Flow of data from group FDC:

(1) Fire missions to subordinate units.

(2) Request for additional fire support from corps artillery FDC when the group is operating as the artillery headquarters for a task force.

(3) Fire capabilities to corps artillery FDC.

(f) The Army Artillery FDC.

1. The army artillery FDC is concerned with the tactical control of artillery units retained under the field army. Operations include: assigning fire missions to the field army artillery units and calling on the corps artillery to participate in important missions. Air or naval support requests received at army artillery FDC are referred to the fire support coordinating agency.

2. FDC Organization. The organization of the fire direction center is varied to meet the requirements and conditions existing. A type of FDC organization consists of:

a. Army Artillery S-3.

b. Army Artillery Assistant S-3.

c. Operations Sergeant.

d. Assistant Operations Sergeant.

3. Division of responsibilities within the FDC. Individual tasks are based on work load and SOP. Responsibilities include:

a. Receive and record data from artillery units and other sources pertaining to artillery fire capabilities, requests for fire, enemy and friendly information, and displacement plans.

b. Maintain an operations map or chart to include fire capabilities, zones of fire, no-fire line, O-O line, bombline, and atomic safety lines when appropriate and disseminate this information to lower artillery units.

c. Maintain an accurate ammunition record of the total expenditures and the amount on hand for designated artillery units.

d. Supervise the execution of artillery atomic fires.

e. Advise the army engineer of survey requirements for army artillery units.

f. Disseminate information on no-fire lines and other limitations on firing to army artillery units.

g. Maintain a record of army artillery ammunition received, expended, on hand, and available from sources outside the army area for allocation to the army.

4. Flow of data to and from FDC.

a. Flow of data to Army FDC.

(1) Requests for additional fire.

(2) Fire capabilities of units retained under army control.

b. Flow of data from Army FDC.

Fire missions to field artillery units retained under army control.

h. Free flight rockets.

(1) See paragraph 5g(1). Target gathering agencies, fire direction centers, and weapons' crews make up the gunnery teams directly involved in the delivery of timely and effective fire.

(a) Target gathering agencies include all visual and electronic means that serve as sources of target information.

(b) FDC (see paragraph 5g(1)(b)).

(c) Weapons' crews (see paragraph 5g(1)(c)).

(2) Input consists of:

(a) Fire order from supported or reinforced headquarters:

1. Target information

a. Coordinates

b. Altitude

c. Special considerations

2. Warhead information

a. Type

b. Yield

c. Height of burst

d. Other

3. Method of fire

4. Time of fire

(b) Current metro information (from Corps Observation Battalions and/or assigned or attached met teams)

(c) Location of firing site determined by battalion survey team from control established by higher headquarters.

(3) Attack of targets (see paragraph 5g(3)). The gunnery officer (S-3) in a battalion FDC does not make the decision to attack a particular target. The decision as to the target, type weapon to fire, height of burst, and ammunition expenditure is made at the supported or reinforced FDC (division, corps, etc).

(4) See paragraph 5g(4). Same as for cannon except that firing data is determined by computation only. Data for each round must be computed individually.

(5) FDC (see paragraph 5g(5)).

(a) Battery FDC (composite battalion)

1. Mission (see paragraph 5g(5)(a)1).

a. Computation of initial data, i.e., laying (pointing) azimuth, base (orienting) angle, initial quadrant elevation, and time of flight.

b. Computation of metro corrections to azimuth, elevation, and time of flight.

c. Computation of final laying azimuth, elevation and time of flight.

2. Battery FDC organization.

a. FDO.

b. Chief Computer.

c. Computers.

3. Division of responsibilities.

a. The fire direction officer is in charge of the fire direction center (the fire direction team). He is assigned this duty by the battery commander. His duties include: supervision of FDC operation and training of personnel, selection of firing point(s), selection of launcher(s) to fire, issuing fire order, maintenance of situation and operations maps, and preparation of records and reports (ammunition and launcher status).

b. The chief computer acts as an operations sergeant, supervises computations made by computers, distributes metro data to the computers, and maintains a firing chart.

c. Computers convert the fire mission and the FDO order into fire commands for the individual launchers.

4. Flow of data to and from FDC.

a. Fire orders from higher headquarters (see paragraph 5h(3), above). The battalion FDO's order would consist of the launcher to fire, the firing point, and the concentration number. The remaining elements would be taken from fire order from high headquarters (i.e., HOB, type warhead, target, etc).

b. Survey data. Target coordinates are provided by higher headquarters in the fire order (see a above). Launcher coordinates are established by the battalion survey team from control provided by higher headquarters.

c. Metro message. Metro information is obtained from higher headquarters and/or organic or attached metorological teams.

d. Firing battery executive officer's report. This report from firing platoon (section) leader to battalion FDC includes measured azimuth, measured base angle, right and left traverse (deflection) limits, minimum elevation, ammunition data, and low-level wind data.

e. Commands to firing sections. Fire direction personnel convert survey data (target coordinates, launcher coordinates), ammunition data, and met data to firing commands(deflection, time of flight, and quadrant elevation) which are transmitted directly to the firing section.

(b) Battalion FDC.

1. Mission (same as battery, see paragraph 5h(5)(a)1).

2. Battalion FDC organization.

a. S-3.

b. Assistant S-3 (FDO).

c. Operations sergeant.

d. Chief computer.

e. Computers.

3. Division of responsibilities.

a. The S-3 is in charge of the fire direction center (fire direction team). The S-3's duties include: selection of launchers to fire, selection of firing point, issuing fire orders, maintenance of situation and operations map, and preparation of records and reports (ammunition and launcher status).

b. The assistant S-3 or fire direction officer exercises direct control over the computation of firing data. He supervises the activities of the chief computer and computers.

c. The operations sergeant is the principle enlisted assistant to the fire direction officer. He acts as platoon sergeant of the operations platoon and supervises the work of all members of the FDC.

d. The chief computer acts as operations sergeant in his absence. (also see paragraph 5h(5)(a)3b.)

e. (See paragraph 5h(5)(a)3c.)

4. Flow of data to and from FDC (see paragraph 5h(5)(a)4)

(c) Above battalion level free flight rocket units inputs and outputs are identical to cannon artillery. Format of some of the orders and reports is changed. These orders and reports are described at Annex 3.

i. Guided Missiles (for considerations similar to those discussed for other systems reference to appropriate paragraph is given).

(1) General. These weapons are characterized by their ability to deliver a powerful warhead over long ranges. The use of these weapons requires the coordinated efforts of all target seeking agencies to locate suitable targets. The composition of the fire control team is as follows:

(a) Target acquisition agency.

(b) Fire direction center.

(c) Weapon crew.

(2) Input is similar to paragraph 5g(2) above and is expanded as follows:

(a) Order from supported or reinforced headquarters to deliver: a specific type (and yield) weapon; on target located by coordinates and altitude; at a particular time. In Lacrosse system, observers may also initiate fire requests.

(b) Current metro information from artillery observation battalion or other team.

(c) Surveyed location of firing site is determined by battalion team from control established by higher headquarters.

(3) Attack of targets (see also paragraph 5g(3) above).

(a) Lacrosse system attacks targets with single missiles or by simultaneous delivery of two or more missiles. Three methods of fire are used:

1. Direct - in this case the guidance station is located so that the target is visible at the guidance station tracker.

2. Offset - guidance station cannot observe target but target is visible to target survey unit located where visible to guidance station.

3. Unobserved - target coordinates are known, but targets cannot be observed by guidance elements.

(4) Similar to cannon (see paragraph 5g(4)) except that data for Redstone, Sergeant, Corporal, and Pershing are obtained by computation only.

(5) Missile battalions handle fire requests in the manner appropriate to the particular system involved. The specific details of fire direction are as follows:

(a) Corporal fire direction center:

1. Converts fire information and certain basic data to fire commands.

2. Organization.

a. FDO.

b. Chief computer.

c. Computers.

3. Division of Responsibilities.

a. Fire direction officer plans, coordinates, and supervises the activities of the fire direction center and is responsible for the training of the personnal. Upon receiving a fire mission he issues a fire order. The fire direction officer controls the fires of the battalion.

b. Chief computor is the chief assistant to the FDC. He supervises work in the fire direction center.

c. Fire direction computer determines firing data based on information contained in the fire mission, fire order and basic data. One of the computers prepares and maintains a fire capabilities chart and a firing chart. Computers record and transmit fire commands.

4. Flow of Data to and from FDC.

a. Target location (from higher headquarters).

b. Weapon to be used - type and yield (from higher headquarters).

c. Time on target - specific time on target or time desired (from higher headquarters).

d. Current metro information (from artillery observation battalion or other source of metro data).

e. Firing site location - determined by battalion survey team from control established by higher headquarters.

f. Guidance settings for the guidance equipment (radar, doppler radio, and computer) and for the guidance equipment on the missile are determined from the fire mission and the basic data. These involve the determination of the relative location of the target and the radar. Target coordinates, radar coordinates, launcher locations and basic metro data are inputs involved. The outputs consist of settings.

g. Warhead settings. These are determined from special tables and information supplied by battalion special weapons officer.

h. Pointing information for the radar is provided from FDC computations.

(b) Lacrosse fire direction center:

1. Converts fire mission information and certain basic data to fire commands.

2. Fire direction organization.

a. FDO.

b. Chief computer.

c. Computer.

d. Chart operator.

e. Operation specialist.

3. Division of Responsibilities.

a. The fire direction officer supervises FDC operations. He makes decisions as to which guidance station will guide a particular missile, the turn and dive angles to be used for a particular trajectory, the firing site to be used and the time to fire.

b. The chief computer supervises the work of enlisted personnel in the FDC. He is the principle assistant to the FDO. He also maintains a state of readiness chart.

c. Fire direction computers work in teams so as to provide double computation of firing data.

d. Chart operator maintains a firing chart and by the use of range azimuth fan and other FDC tools determines settings for guidance stations, tracker, and launcher.

e. Operations specialist maintains a situation map.

4. Flow of Data to and from FDC.

a. Target location may come from a guidance station or may come to the FDC in the form of target coordinates.

b. Weapon (may be stipulated by higher headquarters or may be the result of FDO determinations).

c. Time on target may be specified by higher headquarters or may be directed by FDO.

d. Metro information.

e. Firing site location. Inspected launcher locations and guidance locations can be used in direct and offset methods of fire. For unobserved fire surveyed locations will be used.

f. Guidance settings for the guidance station tracker and other equipment in the guidance station. Guidance settings must also be determined for the missile.

g. Warhead settings for the warhead.

h. Pointing information for the launcher.

(c) Sergeant system. This battalion has no fire direction center. The computer on launcher takes target location, firing position location, and metro data and automatically computes the settings for the missile and computes data required for laying. Laying is by semi-automatic system. Required warhead settings are determined from information in the fire request.

(d) Redstone system.

1. The fire direction center converts fire mission information and certain basic data to fire commands for this system.

2. Organization.

a. FDO.

b. Computers.

c. Draftsman.

3. Division of Responsibilities.

a. The fire direction officer supervises operations of the battalion fire direction center.

b. Computers determine firing data based on information contained in the fire mission and basic data. They record and transmit fire commands.

c. The draftsman prepares and maintains the fire capabilities chart.

4. Flow of data to and from FDC.

a. Target location information comes from higher headquarters.

b. Weapon type and yield comes from higher headquarters.

c. Time on target is determined by higher headquarters.

d. Metro information.

e. Firing site location is determined by battalion survey team from control furnished by higher headquarters.

f. Guidance settings for the inertial guidance system is determined from the relative location of the target and the launcher plus metro information. Guidance settings are made entirely on the missile.

g. Warhead settings are made as prescribed.

h. Pointing information - the launcher is laid in the appropriate direction by battalion personnel.

(e) Pershing missile system. This system is not expected to have a fire direction center of the normal form. This system operation will be similar to that specified for the Sergeant system (see paragraph 5i(5)(c).

III. GENERAL PROCEDURAL EVALUATION AND OPERATIONAL IMPROVEMENTS

6. GENERAL APPROACH

a. The input and output data necessary for technical field artillery fire control was considered at all artillery levels. The flow of these data was analyzed with a view toward eliminating time consuming procedures and improving the system in general.

b. As this study considers only input and output data any evaluation must assume an efficient communication system. A great majority of the necessary inputs and outputs for fire control are generated some distance from the artillery FDC and the effectiveness of the fire is directly related to timely accurate circulation of these data.

c. All functions in the present system such as computing data circulation and reporting are performed by the human brain and by manual action. With the exception of ballistic computations they are relatively simple repetitive operations. Like all similar functions involving human manipulations they exhibit two major disadvantages: one, they are subject to error; two, they are time consuming. Both of these disadvantages are aggravated under combat conditions by such factors as fatigue, mental strain and anxieties.

d. Operational improvements to the present system would fall under one of three broad catagories:

(1) Communications

(2) Computational techniques

(3) Elimination of human data handling errors

e. Examination of the system as a whole, or each of the above mentioned catagories reveals no significant improvement which can be derived from the means at hand - i.e., the human mind or equipment presently available.

f. The present system and equipment are being utilized to their maximum effectiveness. Equipment currently under development will improve the present system. (See Section IV, Discussion of Proposed System Manual).

IV DISCUSSION OF PROPOSED SYSTEM-MANUAL*

7. ASSUMPTIONS PERTAINING TO PROPOSED SYSTEM-MANUAL

a. That all assumptions pertaining to present system (Paragraph 4, Section II) are valid and will also pertain to the proposed system.

b. That weapon system computers possessing the characteristics of field artillery computer (FADAC) and JUKE BOX will be available.

8. NARRATIVE DESCRIPTION OF PROPOSED SYSTEM-MANUAL*

a. Detailed description of the proposed system would largely be a repetition of Part II, paragraph 5, "Narrative Description of Present System". Weapon system computers will have a definite impact on the present system, resulting in the proposed system and eventually leading to some degree of ADP system.

b. Over the years, the artillerymen have sought the perfect solution to the ballistic problem. Such a solution would be accurate under all extremes of geometry and ballistics pertaining to a given weapon system. The search gained impetus from the development of atomic munitions for conventional artillery weapons and the many missiles systems being added to the artillery arsenal. Tremendous strides forward have been made resulting in simplified techniques, improved firing tables, and highly developed graphical equipments.

(1) New ballistic computational techniques are invariably a compromise between simplicity and accuracy. The simplest techniques would be a tabulation of horizontal ranges and the elevations or launch angles necessary to attain those ranges under stipulated conditions. Of course, since these variable stipulated conditions would rarely occur, this solution although simple would be extremely inaccurate. The most accurate solution would be an immensely large accumulation of data depicting corrections for every conceivable combination of geometric and ballistic elements.

(2) The computational solutions to the technical fire control problem, either by tabular or graphical methods, are performed by the human and like all similar functions are time consuming and subject to error.

c. Electronic digital gun data computers appear to offer the ultimate solution to the problem of increased accuracy and speed. The development of the Field Artillery Fire Control System M-35 was a significant step in the right direction. This system utilized an electromechanical analog computer and opened a new era in gunnery techniques. The Fire Control System M-35 resulted in improvement over graphical means in both speed and accuracy, but this experience also pointed to needs for improvement in the overall fire control problem. The analog system had several disadvantages. It sufficed in accuracy of solution for the shorter range weapons such as the 105 and 155 mm Howitzers; however, the need was to expand the computer application to all artillery weapons. This indicated a more flexible system of computing than the analog system was capable of providing and lead quite naturally into the digital field. The digital computer can be programmed to accommodate ballistic and geometric solutions for any present weapon system giving the desired accuracy, flexibility and speed.

d. The principle difference between the present and proposed systems lies in the fact that weapon system digital computers will be employed throughout all firing units of the artillery. For example, it is envisioned that FADAC will be programmed to solve the cannon and free flight rocket ballistic problems and be issued one per battery-sized unit. The JUKE BOX computer, programmed to solve the Redstone Missile problem, is now in the hands of the user. The Sergeant computer is under development and will be an integral part of this system mounted on the launcher.

e. The advantages of the proposed system are:

(1) Accuracy.

(2) Speed.

(3) Elimination of human computational errors.

f. The disadvantages of the proposed system are:

(1) Equipment is subject to failure.

(2) Back-up manual system is required in case of computer failure.

(3) All inputs and outputs will be subject to human processing at all echelons which increases error and is time consuming.

(4) The weapon system computers are not tied into a network and thus do not have the capability of transmitting and seeking information from other computers.

*The term "manual" as here employed signifies the system wherein all fire direction action beyond technical ballistic solutions are performed manually. Under this definition the firing data are generated by computer as an isolated technical computing action, not as an ADPS function.

V DISCUSSION OF PROPOSED SYSTEM - ADPS

9. ASSUMPTIONS PERTAINING TO PROPOSED SYSTEM - ADPS

a. Organizational changes in the type field Army (Section II, para 4a) will not effect the requirement for each artillery echelon to have the input and output data necessary for solution of the technical fire control problem.

b. Computers capable of meeting the functional requirements of processing technical fire control input and output data will be available to combat troops in the field.

c. That all equipment as described in AEP - SIG - 940 - 22, dated 15 March 1957, will be available for the proposed ADP System.

d. The computer network handling technical fire control input and output data will be capable of:

(1) Transferring data as desired between all computers in the network.

(2) Responding to query from other computers or devices in the network.

e. Weapon system computers will be an integral part of the computer network; however, their network function will have to be subordinated to their primary function of computing a solution to the ballistic fire control problem.

f. That the following computer equipment will be available at the levels indicated:

(1) Fire units (battery or battalion) - A standard weapon system computer.

(2) Division, group, corps and army artillery Field Data computer(s), the size to be determined by application studies.

10. NARRATIVE DESCRIPTION OF PROPOSED SYSTEM

a. The proposed ADP system will perform essentially the same functions which are currently performed under the present system with the exceptions that both human error and time consuming manual procedures can be minimized or eliminated. ADP techniques are introduced primarily as a replacement for the methods of manually recording, tabulating, filing and transmitting data from one echelon to another.

b. The proposed system has the same inputs and outputs as the present manual system, however, equipment which could transmit, display, store and recall these inputs and outputs would virtually eliminate the disadvantages of the present system.

c. As discussed in the present system, solution of the artillery technical fire control problem requires certain input data. A large amount of the data is generated some distance from the firing unit and any solution, rather by manual or computer methods is dependent on this data. For example, met information. In the present manual system met data is usually generated at corps (observation battalion met station) and in the worse case separately transmitted through the communications chain to corps artillery, division artillery, artillery battalion and artillery battery requiring manual data

handling procedures at each level. Conversely, as a result of fire mission(s), certain output data is generated and must be transmitted through the communications link to the higher headquarters concerned. For example, requests for additional fire, reports of targets fired on, and ammunition status data.

d. The proposed system would provide for rapid and accurate circulation of information. In the proposed ADP system met data would be inserted into the computer network at corp artillery, transmitted throughout the network in digital form with the capability for display and storage at all levels. This capability for more timely met data would mean significant improvement in the accuracy of artillery fires. Met data is only an example, all other inputs and outputs would be treated in a similar manner.

e. ADPS as applied to field artillery technical fire control input and output data is a function of information storage, retrieval and transmission. (See Master Logical Flow Chart at ANNEX 6, Appendix D.)

11. PROBLEM AREAS INCIDENT TO THE USE OF ADPS.

a. Weapon System computers for solution of the artillery technical fire control problem will create a degree of dependence upon equipment which is subject to failure. In the event of failure, use would be made of available computer facilities of other units; this failing, provision must be made for manual solution of the problem.

b. Weapon system computers will have the capability of working in the ADPS net. These computers will send, receive and store information. Priority, however, must always rest with the primary function of computing firing data.

c. The ADPS will be highly dependent upon a complex communication system. Provision must be made for a means of communications, in event of failure.

d. The possibility of insertion of false data and the removal of data by unauthorized personnel will exist. Prevention of such occurrences should be a consideration of machine design and computer programs.

e. Additional study will be necessary to determine how long data should be stored (filed) within the memory devices of the computers.

f. All personnel using the proposed system must be inculcated with the concept that the system is not a substitute for accuracy. Output data will only be as accurate as the input data.

VI. STUDY RESULTS.

12. DETAILED CONCLUSIONS.

a. Computational solutions to the technical fire control problem, either by tabular or graphical methods, are at the present time performed by the human brain and are time consuming and subject to error.

b. Electronic digital weapon system computers appear to offer the ultimate solution in both accuracy and speed.

c. If weapon system computer data inputs and outputs are subject to human processing at all echelons, increased error and time loss will result.

d. Automatic data processing will facilitate the rapid and accurate transmission, storage and retrieval of information.

e. Weapon system computers will have the capability of working in an ADPS network, however, their priority function must be one of computing firing data.

f. Utilization of ADP at one level will require utilization of ADP at all levels for the full realization of the speed and accuracy of the system.

g. The ADPS system will be dependent on a complex communication system. Some means must be provided for a back-up system of communications in the event of failure.

h. A test application of ADPS to artillery fire control, as opposed to the use of weapon system computers without communication linkage to an ADPS, will be required before a realistic evaluation of ADPS can be made. Only after the equipment has been made available and the overall flexibility determined can a really valid conclusion be established.

13. DETAILED RECOMMENDATIONS.

a. Approval of this study and its findings.

b. Action by USCONARC to provide the data transmission and storage capability visualized for the integrated ADPS - weapon system computer network.

c. All further efforts in this study field be closely coordinated with the U. S. Army Artillery and Missile School.

d. That this coordination paragraph c above be effected by means of a small working group consisting of military representatives from the USAA&MS and the ADPS Test Facility Systems Group. This coordination should result in savings of time and money in the overall analysis and programming effort necessary for application of ADPS to Field Artillery Technical Fire Control Input/Output Data.

ANNEX 1

ORGANIZATION OF STUDY TASK GROUP

The U. S. Army Artillery and Missile School, Fort Sill, Oklahoma, was assigned this study by HQ USCONARC directive dated 20 May 1958. Captain Russell J. Miller of the Gunnery Department, Research and Review Division was assigned as the project officer.

ANNEX 2

GLOSSARY

1. ADP - Automatic Data Processing.

2. ADPS - Automatic Data Processing System.

3. Alphanumeric Length - Total number of letters and numbers.

4. Calibration Data - Data applied to a gun in a battery to make its center of burst or impact form a definite predetermined pattern with the centers of bursts of the other guns in the same battery.

5. Character - A digit, alphabetical letter, symbol, or punctuation mark that can be read into the computer.

6. Charge - In some types of cannon artillery, the projectile and the propellant are loaded separately. The propellant is divided up into increments called charges.

7. Computer Input - Information transferred from secondary or external sources into the internal storage (memory) of the computer. (This means that it must be in a form language acceptable to the computer. Examples of external sources include, but are not necessarily limited to punched cards, tapes, etc, and magnetic tape).

8. Computer Output - 1. Information transferred from the internal storage of a computer to secondary storage. 2. Information transferred to any device outside of the computer.

9. Concentration Number - An alphanumeric symbol used to designate any target. This target may or may not have been fired upon previously.

10. Counterfire - Fire intended to destroy or neutralize enemy weapons.

11. Data for Replot - The coordinates, altitude, fuze, and concentration number of a target that has been fired upon. The coordinates and corresponding altitude are the true values, and not necessarily those obtained initially from the fire for effect elevation and site.

12. Deflection - The horizontal, clockwise angle from the line of fire or line of fire extended to a designated aiming point. Deflection is never greater than 3200 mils.

13. Drift Correction - The correction applied to the deflection to compensate for the drift of projectile. This drift is a result of the forces of air resistance and gravity on the rotating projectile.

14. Element - One specific input item. This item might be one word, line, or several lines in length.

15. Elevation - The vertical angle between the line from the muzzle of the weapon to the target and the axis of the bore.

16. Executive Report - The executive officer reports to the FDC all conditions that affect the firing of battery.

17. FADAC - Field Artillery Digital Automatic Computer.

18. Fire Control - All operations, connected with the planning, preparation, and actual application of fire on a target (see tactical fire control and technical fire control).

19. Fire Control Equipment - Equipment required and used to aim guns, or controlled missiles at a particular target. Fire control equipment includes all instruments used in calculating and adjusting the proper elevation and deflection of guns or missiles in flight. Included are such items as radars, telescopes, range finders, predictors, directors, computers, power plants, and communications control systems connecting these elements.

20. Fire Control System - A group of interrelated fire control equipment and/or instruments designed for use with a weapon or group of identical weapons.

21. Fire Mission - A specific assignment given to a fire unit.

22. Fire Plan - The prearranged plan of fire to be delivered. It includes the priority of fire, the time of fire, and the concentration numbers.

23. Fire Unit - The smallest combat unit normally employed to shoot a complete fire mission.

24. FSCC - Fire Support Coordination Center.

25. Fuze Setting - The time in seconds between activation of the time measuring mechanism and the functioning of the fuze.

26. Hard Copy - Document in readable form.

27. Juke Box - Firing Data Computer (Redstone).

28. "K" - A factor that is applied to the actual range for a point to determine the range which must be fired to hit that point. This factor is the result of registration and/or the solution of a metro message.

29. Massed Nonatomic Fires - Delivery of a maximum number of rounds from many pieces in the shortest possible time and without adjustment.

30. Met Message - A meteorological message giving data about atmospheric conditions.

31. Orienting Angle - The horizontal clockwise angle from the line of fire to the orienting line or the orienting line extended is called the orienting angle. It is never greater than 3200 mils. The orienting line is a line of known direction materialized on the ground.

32. Registration Point - Terrain feature or other designated point upon which fire is adjusted to obtain registration corrections.

33. S-3 - The officer in a unit who is in charge of the primary operation of that unit, as opposed to the secondary operations, such as record keeping, intelligence, and supply.

34. S-3 - Journal - A section journal in which all incidents, messages and orders affecting the S-3 Section are recorded with an entry describing the action taken if any.

35. SOP - (Standard Operating Procedure) - The procedure, varying from unit to unit, by which that unit accomplished its assigned tasks. This procedure is normally based on the procedures outlined in army field and technical manuals.

36. Special Corrections - Corrections applied to deflection, quadrant elevation, and time which compensate for the uneven distribution of the guns in the firing unit area and the velocity error.

37. System Input - Any information entering a particular system. (It may be verbal or written, and is not necessarily in a form and language acceptable by the computer.)

38. System Output - Any information produced by the particular system. (It does not necessarily need to be in the form and language of the computer.)

39. Tactical Fire Control - The manner in which fire power is employed with regard to selection of targets, opening, suspending, or ceasing fire, and classes of fire.

40. Target List - A list of known or suspect targets that might be fired upon in a given situation.

41. Technical Fire Control - The method or means employed to place accurate fire on the target.

42. Time on Target - A given time when simultaneously, the initial rounds from every unit firing on a target will land on that target.

43. TOE - (Table of Organization and Equipment) - A table pertaining to a particular type of unit which specifies the equipment and personnel normally found in that unit.

44. VE (Velocity Error) - Those ballistic variations from firing table standards which cannot be measured (wear of tube, shell surface finish, powder moisture content, etc.) and for which the resultant range effect can be determined only by firing, are, for convenience, grouped together in one quantity and termed velocity error. (VE).

BIBLIOGRAPHY

1. Letter, ATSWD-G 413.5/116 (26 Aug 58), Hq USCONARC, 26 Aug 58. Subject, "Combat Development Study Directive: Application of Automatic Data Processing System(s) (ADPS) to Field Artillery Technical Fire Control Input/Output Data."

2. USAEPG-SIG 940-25, Instruction Booklet, "Preparation and Reporting Format of Systems Analysis Study on Potential Tactical Army ADPS Application", dated 1 Nov 1957.

3. Letter, ATTNG - D & R 322/13 (Army) (9 July 57), Hq USCONARC, 9 July 1957. Subject, "Revised Type Corps and Field Army".

4. FM 6-40, dated April 1957, (Field Artillery Gunnery).

5. FM 6-20, dated December 1958, (Field Artillery Tactics and Techniques).

6. SR 320-5-1 with Change 1, dated November 1953 (Dictionary of United States Army Terms).

7. USAAMS Project 58-2, "Application of ADPS to Tactical Ammunition Status Reporting."

8. USAAMS Project 58-3, "Application of ADPS to Artillery Capabilities Computation."

9. USAAMS Project 58-5, "Application of ADPS to Field Artillery Survey."

ANNEX 3

PRESENT SYSTEM

APPENDICES:

A. Input, Output, and File Definition

B. Organization Definition

C. Flow Charts

APPENDIX A TO ANNEX 3

INPUT, OUTPUT, AND FILE DEFINITION

1. INPUT.

a. To cannon battery FDC.

(1) Fire missions from air, ground observers and battalion FDC.

(a) Observer's fire request (Sample Fig 1, Form Fig 1a):

1. Maximum of 16 elements. Up to 60 alphanumeric characters per line.

2. There are 120 characters in an average request. The maximum request would require not more than 160 characters.

3. The number of these requests will depend on the tactical situation. A reasonable estimate would be 15 requests each 24-hour period.

4. Average time to transmit this request is 60 seconds.

(b) Subsequent fire requests (Sample Fig 2, Form Fig 1a).

1. Maximum of 10 elements. Up to 12 alphanumeric characters per line.

2. There are 25 characters in an average request. The maximum request would require not more than 60 characters.

3. The number of these requests will depend on the number of missions adjusted and the number of corrections per mission. A reasonable estimate would be 5 corrections per mission or a total of 75 corrections per 24-hour period.

4. Average time to transmit this request is 15 seconds.

(c) Firing battery data sheet (Sample Fig 3)

1. Maximum number of elements per data sheet is 6. Up to 70 alphanumeric characters per line.

2. There are 420 characters in each data sheet.

3. The number of data sheets will depend on the tactical situation. A reasonable estimate would be 1 each 24-hour period.

4. Average time to transmit the data is 6 minutes.

(d) Time on target (Sample Fig 4, Form Fig 1a)

1. Maximum of 11 elements. Up to 34 alphanumeric characters per line.

2. There are 144 characters in an average mission. The maximum request would not exceed 160 characters.

3. The number of these missions will depend on the tactical situation. A reasonable estimate would be 2 missions each 24-hour period.

4. Average time to transmit this mission is 60 seconds.

(e) Fire for effect location (Sample Fig 5)

1. Maximum of 4 elements. Up to 20 alphanumeric characters per line.

2. There are 71 characters in an average transmission. The maximum transmission would not require more than 85 characters.

3. The number of these transmissions will depend on the tactical situation. A reasonable estimate would be 5 each 24-hour period.

4. Average time to transmit is 40 seconds.

(2) Fire orders (Sample Fig 6, Form Fig 1a).

(a) Maximum of 14 elements. Up to 35 alphanumeric characters per line.

(b) There are 120 characters in an average order. The maximum order would require not more than 180 characters.

(c) The number of these orders will depend on the organization for combat and the tactical situation. A reasonable estimate would be 10 orders each 24-hour period.

(d) Average time to transmit or issue this order is 20 seconds.

(3) Metro messages (Sample Fig 7, Form Fig 7a).

(a) Maximum of 13 lines. Up to 10 alphanumeric characters per line.

(b) There are 90 characters in an average message. The maximum report would require not more than 140 characters.

(c) The maximum number of messages would be 12 per 24-hour period.

(d) Average time to transmit this message is 180 seconds.

(4) Replot data (Sample Fig 8, Form Fig 1a).

(a) Maximum 6 elements. Up to 20 alphanumeric characters per line.

(b) There are 97 characters in an average transmission. The maximum would require no more than 100 characters.

(c) The number of these transmissions would depend on the tactical situation and the organization for combat. A reasonable estimate would be 5 each 24-hour period.

(d) Average time to transmit data is 30 seconds.

(5) Survey data (Sample Fig 9).

(a) Maximum of 7 elements. Up to 75 alphanumeric characters per element.

(b) There are 227 characters in an average transmission. The maximum transmission would not exceed 300 characters.

(c) The number of these transmissions will depend on the tactical situation and the organization for combat. A reasonable number would be 1 each 24-hour period.

(d) Average time to transmit data is 240 seconds.

(6) Fire commands from battalion FDC (Form fig 1a)

(a) Maximum of 15 elements. Up to 30 alphanumeric characters per element.

(b) There are 110 characters in an average transmission. The maximum would require no more than 250 characters.

(c) The number of these transmissions will depend on the tactical situation and the organization for combat. A reasonable number would be 2 each 24-hour period.

(d) Average time to transmit data is 60 seconds.

b. To cannon battalion FDC.

(1) Fire missions from air and ground observers

(a) Observer's fire request (sample Fig 1, Form Fig 1a)

1. See a(1)(a)1 above.

2. See a(1)(a)2 above.

3. The number of these requests will depend on the tactical situation and the organization for combat. A reasonable estimate would be 30 each 24-hour period.

4. See a(1)(a)4 above.

(b) Subsequent fire request (sample Fig 2, Form Fig 1a)

1. See a(1)(b)1 above.

2. See a(1)(b)2 above.

3. The number of these requests will depend on the number of missions adjusted and the number of corrections per mission. A reasonable estimate would be 5 corrections per mission or 150 corrections per 24-hour period.

4. See a(1)(b)4 above.

(2) Fire missions from higher artillery headquarters

(a) Fire mission (sample Fig 10, Form Fig 1a)

1. Maximum of 13 elements or lines. Up to 40 alphanumeric characters per line.

2. There are 224 characters in an average mission. The maximum mission would require no more than 250 characters.

3. The number of these missions will depend on the tactical situation and the organization for combat. A reasonable estimate would be 4 every 24-hour period.

4. Average time to transmit this mission is 60 seconds.

(b) Fire on target (Sample Fig 5, Form Fig 1a).

1. See a(1)(d)1 above.

2. See a(1)(d)2 above.

3. The number of these missions will depend on the tactical situation. A reasonable estimate would be 1 every 24-hour period.

4. See a(1)(d)4 above.

(3) Metro messages (Sample Fig 7, Form Fig 7a).

(a) See a(3)(a) above.

(b) See a(3)(b) above.

(c) See a(3)(c) above.

(d) See a(3)(d) above.

(4) Replot data from batteries (Sample Fig 8, Form Fig 1a).

(a) See a(4)(a) above.

(b) See a(4)(b) above.

(c) The number of these transmissions would depend on the tactical situation and the organization for combat. A reasonable estimate would be 15 each 24-hour period.

(d) See a(4)(d) above.

(5) Fire for effect data from batteries (Sample Fig 5).

(a) See a(1)(e)1 above.

(b) See a(1)(e)2 above.

(c) The number of these transmissions will depend on the tactical situation and the organization for combat. A reasonable estimate would be 15 each 24-hour period.

(d) See a(1)(e)4 above.

(6) Report of targets fired on. (Sample Fig 11).

(a) Maximum of 4 elements or lines. Up to 40 alphanumeric characters per line.

(b) There are 101 characters in an average transmission. The maximum transmission would not exceed 150 characters.

(c) The number of these transmissions will depend on the tactical situation and the organization for combat. A reasonable estimate would be 30 transmissions each 24-hour period.

(d) Average time to transmit is 30 seconds.

(7) Executives report (Sample Fig 12).

(a) Maximum of 10 elements or lines. Up to 300 alphanumeric characters per line.

(b) There are 550 characters in an average report. The maximum report would require not more than 1000 characters.

(c) The number of these reports will depend on the tactical situation, i.e., how many times the battery displaces. A reasonable estimate would be 2 reports each 24-hour period.

(d) Average time to transmit this report is 180 seconds.

c. To Division Artillery FDC.

(1) Fire missions from higher artillery headquarters.

(a) Fire mission (Sample Fig 10)

1. See b(2)(a)1 above.

2. See b(2)(a)2 above.

3. The number of these missions will depend on the tactical situation. A reasonable estimate would be 1 each 24-hour period.

4. See b(2)(a)4 above.

(b) Time on target (Sample Fig 4).

1. See a(1)(d)1 above.

2. See a(1)(d)2 above.

3. The number of these missions will depend on the tactical situation. A reasonable estimate would be 1 each 72-hour period.

4. See a(1)(d)4 above.

(2) Request for additional fire from subordinate units (Sample Fig 13)

(a) Maximum of 11 elements or lines. Up to 60 alphanumeric characters per line.

(b) There are 280 characters in an average request. The maximum request would require not more than 300 characters.

(c) The number of these requests will depend on the tactical situation and the organization for combat. A reasonable estimate would be 6 every 24-hour period.

(d) Average time to transmit this request is 90 seconds.

(3) Fire capabilities (Sample Fig 14)

(a) Maximum or 3 elements or lines. Up to 37 alphanumeric characters per line.

(b) There are 96 characters in an average transmission. The maximum transmission would require not more than 120 characters.

(c) The number of these transmissions will depend on the tactical situation and the organization for combat. A reasonable estimate would be 4 transmissions each 24-hour period.

(d) Average time to transmit is 20 seconds.

d. To Corps Artillery FDC.

(1) Fire missions from higher Artillery headquarters

(a) Fire mission (Sample Fig 10, Form Fig 1a).

1. See b(2)(a)1 above.

2. See b(2)(a)2 above.

3. The number of these missions will depend on the tactical situation. A reasonable estimate would be 2 every 24-hour period.

4. See b(2)(a)4 above.

(b) Time on target (Sample Fig 4, Form Fig 1a).

1. See a(1)(d)1 above.

2. See a(1)(d)2 above.

3. The number of these missions will depend on the tactical situation. A reasonable estimate would be 1 every 72-hour period.

4. See a(1)(d)4 above.

(2) Request for additional fire (Sample Fig 13).

(a) See c(2)(a) above.

(b) See c(2)(b) above.

(c) The number of these requests will depend on the tactical situation. A reasonable estimate would be 3 every 24-hour period.

(d) See c(2)(d) above.

(3) Fire capabilities (Sample Fig 14).

(a) See c(3)(a) above.

(b) See c(3)(b) above.

(c) The number of these transmissions will depend on the tactical situation and the organization for combat. A reasonable estimate would be 2 every 24-hour period.

(d) See c(3)(d) above.

e. To Artillery Group FDC.

(1) Fire missions from higher Artillery headquarters.

(a) Fire missions (Sample Fig 10, Form Fig 1a).

1. See b(2)(a)1 above.

2. See b(2)(a)2 above.

3. The number of these missions will depend on the tactical situation. A reasonable estimate would be 12 every 24-hour period.

4. See b(2)(a)4 above.

(b) Time on target (sample Fig 4 Form Fig 1a)

1. See a(1)(d)1 above.

2. See a(1)(d)2 above.

3. The number of these missions will depend on the tactical situation. A reasonable estimate would be 1 every 72-hour period.

4. See a(1)(d)4 above.

(2) Fire capabilities (sample Fig 14)

(a) See c(3)(a) above.

(b) See c(3)(b) above.

(c) The number of these transmissions will depend on the tactical situation. A reasonable estimate would be 2 every 24-hour period.

(d) See c(3)(d) above.

(3) Requests for additional fire support from subordinate units when the group is operating as the Artillery headquarters for a task force. (sample Fig 13)

(a) See c(2)(a) above.

(b) See c(2)(b) above.

(c) See c(2)(c) above.

(d) See c(2)(d) above.

(4) Metro message (sample Fig 7, Form Fig 7a)

(a) See a(3)(a) above.

(b) See a(3)(b) above.

(c) See a(3)(c) above.

(d) See a(3)(d) above.

f. To Army Artillery FDC.

(1) Requests for additional fire (sample Fig 13)

(a) See c(2)(a) above.

(b) See c(2)(b) above.

(c) The number of these requests will depend on the tactical situation. A reasonable estimate would be 1 every 72-hour period.

(d) See c(2)(d) above.

(2) Fire capabilities (Sample Fig 14)

(a) See c(3)(a) above.

(b) See c(3)(b) above.

(c) The number of these transmissions will depend on the tactical situation. A reasonable estimate would be 1 every 24-hour period.

(d) See c(3)(d) above.

g. To rocket battery FDC (composite battalion only; there is no battery FDC in an Honest John battalion).

(1) Fire mission (Sample Fig 15, Form Fig 15a).

(a) Maximum of 9 elements or lines. Up to 40 alphanumeric characters per line.

(b) There are 100 characters in an average mission. The maximum mission would require not more than 120 characters.

(c) The number of these fire missions will depend on the tactical situation. A reasonable estimate would be 6 missions each 24-hour period.

(d) Average time to transmit this mission is 60 seconds.

(2) Fire order (Sample Fig 16, Form Fig 15a).

(a) Maximum of 3 elements or lines. Up to 30 alphanumeric characters per line.

(b) There are 80 characters in an average order. The maximum order would require not more than 100 characters.

(c) The number of orders will depend on the number of fire missions. A reasonable estimate would be 6 orders each 24-hour period. (more than one per fire mission may be required).

(d) Average time to transmit this order is 10 seconds.

(3) Metro messages (Sample Fig 7, Form Fig 7a). Same as for cannon except Type 4 message is used.

(a) See a(3)a above.

(b) See a(3)b above.

(c) See a(3)c above.

(d) See a(3)d above.

(4) Launching platoon commander's report (Sample Fig 17, Form Fig 15a).

(a) Maximum of 12 elements or lines. Up to 35 alphanumeric characters per line.

(b) There are 260 characters in an average report. The maximum report would require not more than 260 characters.

(c) The number of reports will depend on the tactical situation, specifically - the number of fire missions and the number of positions a unit occupies. A reasonable estimate would be 10 reports each 24-hour period.

(d) Average time to transmit this mission is 3 minutes.

(5) Survey Section Report (Sample Fig 18, Form Fig 15a).

(a) Maximum of 4 elements or lines. Up to 25 alphanumeric characters per line.

(b) There are 90 characters in an average report. The maximum mission would require not more than 100 characters.

(c) The number of these reports will depend on the tactical situation, specifically -- on the number of firing points selected. A reasonable estimate would be 10 reports each 24-hour period.

(d) Average time to transmit this report is 60 seconds.

(6) Low Level Wind Correction Report (Sample Fig 19, Form Fig 15a).

(a) Maximum of 2 elements or lines. Up to 80 alphanumeric characters per line.

(b) There are 80 characters in an average report. The maximum report would require not more than 80 characters.

(c) The number of these reports will depend on the number of rockets fired. A reasonable estimate would be 5 reports (estimated 5 missions) each 24-hour period.

(d) Average time to transmit this report is 15 seconds.

h. To rocket battalion FDC.

(1) Fire mission (Sample Fig 15, Form Fig 15a).

(a) See g(1)(a) above.

(b) See g(1)(b) above.

(c) The number of these fire missions will depend on the tactical situation. A reasonable estimate would be 10 missions each 24-hour period.

(d) See g(1)(d) above.

(2) Fire orders (Sample Fig 16, Form Fig 15a).

(a) See g(2)(a) above.

(b) See g(2)(b) above.

(c) The number of orders will depend on the tactical situation. A reasonable estimate would be 12 orders each 24-hour period. (More than one per fire mission may be required.)

(d) See g(2)(d) above.

(3) Met messages (Sample Fig 7, Form Fig 7a) Same as for cannon except Type 4 message is used.

(a) See g(3)a above.

(b) See g(3)b above.

(c) See g(3)c above.

(d) See g(3)d above.

(4) Launching Platoon Commander's Report (Sample Fig 17, Form Fig 15a).

(a) See g(4)(a).

(b) See g(4)(b).

(c) The number of reports will depend on the tactical situation, specifically - the number of fire missions and the number of positions a unit occupies. A reasonable estimate would be 20 reports each 24-hour period.

(d) See g(4)(d).

(5) Survey section report (Sample Fig 18, Form Fig 15a).

(a) See g(5)(a).

(b) See g(5)(b).

(c) The number of these reports will depend on the tactical situation, specifically - on the number of firing points selected. A reasonable estimate would be 10 reports each 24-hour period.

(d) See g(5)(d).

(6) Low Level Wind Correction report (Sample Fig 19, Form Fig 15a).

(a) See g(6)(a).

(b) See g(6)(b).

(c) The number of these reports will depend on the number of rockets fired. A reasonable estimate would be 10 reports (estimated 10 missions) each 24-hour period.

(d) See g(6)(d)

i. To Division Artillery FDC.

(1) Atomic fire order (Sample Fig 20).

(a) Maximum of 11 elements or lines. Up to 40 alphanumeric characters per line.

(b) There are 150 characters in an average order. Maximum order would require not more than 250 characters.

(c) The number of these orders will depend on the tactical situation. A reasonable estimate would be 6 orders each 24-hour period.

(d) Average time to transmit this order is 90 seconds.

NOTE: Non-atomic fire order omits unnecessary elements.

(2) Target list (Sample Fig 21).

(a) Maximum of 7 elements or lines. Up to 700 alphanumeric characters per element (based on 25 targets).

(b) There are 1700 characters in an average target list. The maximum list would require not more than 3000 characters.

(c) The number of these target lists will depend on the tactical situation. A reasonable estimate would be one list each 24-hour period.

(d) Average time to transmit this target list is 10 minutes.

(3) Atomic fire request (Sample Fig 22).

(a) Maximum of 7 elements or lines. Up to 25 alphanumeric characters per line.

(b) There are 150 characters in an avorage request. The maximum request would require not more than 200 characters.

(c) The number of these requests will depend on the tactical situation. A reasonable estimate would be 12 requests each 24-hour period.

(d) Average time to transmit this request is 60 seconds.

NOTE: Non-atomic fire request omits unnecessary elements.

(4) Air observer's fire request (Sample Fig 1, Form Fig 1a).

(a) See g(1)(a).

(b) See g(1)(b).

(c) The number of these requests will depend on the tactical situation. A reasonable estimate would be 2 requests each 24-hour period.

(d) See g(1)(d).

j. To Corps Artillery FDC.

(1) Atomic fire order (Sample 20).

(a) See i(1)(a).

(b) See i(1)(b).

(c) The number of these fire orders will depend on the tactical situation. A reasonable estimate would be 12 orders each 24-hour period.

(d) See i(1)(d).

NOTE: Non-atomic fire order omits unnecessary elements.

(2) Target list (Sample Fig 21).

(a) See i(2)(a).

(b) See i(2)(b).

(c) See i(2)(c).

(d) See i(2)(d).

(3) Atomic fire request (Sample Fig 22).

(a) See i(3)(a).

(b) See i(3)(b).

(c) The number of these requests will depend on the tactical situation. A reasonable estimate would be 20 requests each 24-hour period.

(d) See i(3)(d).

NOTE: Non-atomic fire request omits unnecessary elements.

(4) Air observer's fire request (Sample Fig 1, Form Fig 1a).

(a) See g(1)(a).

(b) See g(1)(b).

(c) The number of these requests will depend on tactical situation. A reasonable estimate would be 2 requests each 24-hour period.

(d) See g(1)(d).

k. To Artillery Group FDC

(1) Atomic fire order (Sample Fig 20).

(a) See i(1)(a).

(b) See i(1)(b).

(c) The number of these orders will depend on the tactical situation. A reasonable estimate would be 22 orders each 24-hour period.

(d) See i(1)(d).

(2) Target list (Sample Fig 21).

(a) See i(2)(a).

(b) See i(2)(b).

(c) See i(2)(c).

(d) See i(2)(d).

(3) Atomic fire request (Sample Fig 22).

(a) See i(3)(a).

(b) See i(3)(b).

(c) The number of these requests will depend on the tactical situation. A reasonable estimate would be 10 requests each 24-hour period.

(d) See i(3)(d).

NOTE: Non-atomic fire requests omits unnecessary elements.

(4) Air observer's fire request (Sample Fig 1, Form Fig 1a).

(a) See g(1)(a).

(b) See g(1)(b).

(c) The number of these requests will depend on tactical situation. A reasonable estimate would be 10 requests each 24-hour period.

(d) See g(1)(d).

l. To Army Artillery FDC.

(1) Atomic fire request (Sample Fig 22).

(a) See i(3)(a).

(b) See i(3)(b).

(c) The number of these requests will depend on the tactical situation. A reasonable estimate would be 12 requests each 24-hour period.

(d) See i(3)(d).

NOTE: Non-atomic fire request omits unnecessary elements.

m. To Corporal battalion FDC.

(1) Fire mission (Sample Fig 23, Form Fig 23a)

(a) Maximum of 9 elements or lines. Up to 55 alphanumeric characters per line.

(b) There are 256 characters in an average fire mission. The maximum fire missions would require not more than 252 characters.

(c) The number of these characters will depend on the tactical situation. A reasonable estimate would be 6 each 24-hour period.

(d) Average time to transmit this fire mission is 60 seconds.

(2) Metro messages (Sample Fig 7, Form Fig 7a)

(a) Maximum of 1 element or line. Up to 55 alphanumeric characters per line. (Only Line 13 of a Type 4 message).

(b) There are 70 characters in an average request. The maximum request would require not more than 70 characters.

(c) The maximum number of messages will be 12 per 24-hour period.

(d) Average time to transmit this message is 30 seconds.

(3) Basic survey data (Sample Fig 24, Form Fig 23a).

(a) Maximum of 11 elements or lines up to 124 alphanumeric characters per line.

(b) There are 735 characters in an average basic survey data report. The maximum basic survey data report would require not more than 735 characters.

(c) The number of these characters will depend on the tactical situation. A reasonable estimate would be 12 each 24-hour period.

(d) Average time to transmit the survey data is 180 seconds.

(4) Ammunition record (Sample Fig 25, Form Fig 25a).

(a) Maximum of 15 elements or lines. Up to 142 alphanumeric characters per line.

(b) There are 535 characters in the average ammunition record. The maximum ammunition record would require not more than 535 characters.

(c) The number of these characters will depend on the tactical situation. A reasonable estimate would be 12 each 24-hour period.

(d) Average time to transmit the ammunition record is 180 seconds.

n. To Redstone battalion FDC.

(1) Fire mission (Sample Fig 26).

(a) Maximum of 8 elements or lines. Up to 76 alphanumeric characters per line.

(b) There are 203 characters in an average fire mission. The maximum fire mission would require not more than 286 characters.

(c) The number of these fire missions will depend on the tactical situation. A reasonable estimate would be 4 each 24-hour period.

(d) Average time to transmit this fire mission is 60 seconds.

(2) Survey data (Sample Fig 27).

(a) Maximum of 4 elements or lines. Up to 79 alphanumeric characters per line.

(b) There are 122 characters in an average survey report. The maximum survey reports would require not more than 207 characters.

(c) The number of these survey reports will depend on the tactical situation. A reasonable estimate would be 6 each 24-hour period.

(d) Average time to transmit these survey data is 50 seconds.

(3) Status data (Sample Fig 28).

(a) Maximum of 3 elements or lines. Up to 63 alphanumeric characters per line.

(b) There are 95 characters on an average status data report. The maximum status data report would require not more than 95 characters.

(c) The number of these status data reports will depend on the tactical situation. A reasonable estimate would be 4 each 24-hour period.

(d) Average time to transmit these status data is 60 seconds.

(4) Status and Readiness chart (Sample Fig 29).

(a) Maximum of 15 elements or lines. Up to 27 alphanumeric characters per line.

(b) There are 249 characters in an average status and readiness chart. The maximum status and readiness chart would require not more than 1196 characters.

(c) The number of these status and readiness charts will depend on the tactical situation. A reasonable estimate would be 6 each 24-hour period.

(d) Average time to transmit this status and readiness chart is 120 seconds.

o. To Lacrosse battalion FDC.

(1) Fire missions for various method of fire will require:

(a) Direct method of fire (Sample Fig 30).

1. Maximum of 8 elements or lines. Up to 20 alphanumeric characters per line.

2. There are 117 characters in an average fire mission. The maximum fire mission would require not more than 120 characters.

3. The number of these missions will depend on the tactical situation. A reasonable estimate would be 8 each 24-hour period.

4. Average time to transmit this fire mission is 20 seconds.

(b) Offset method of fire (Sample Fig 31).

1. Maximum of 19 elements or lines. Up to 25 alphanumeric characters per line.

2. There are 198 characters in an average offset fire mission. The maximum offset fire mission would not require more than 200 characters.

3. The number of these missions will depend on the tactical situation. A reasonable estimate would be 12 each 24-hour period.

4. Average time to transmit this fire mission is 60 seconds.

(c) Unobserved fire (Sample Fig 32).

1. Maximum of 8 elements or lines. Up to 17 alphanumeric characters per line.

2. There are 86 characters in an average unobserved fire mission. The maximum unobserved fire mission would require not more than 90 characters.

3. The number of these missions will depend on the tactical situation. A reasonable estimate would be 30 each 24-hour period.

4. Average time to transmit this fire mission is 20 seconds.

(2) Metro messages (Sample Fig 7, Form Fig 7a. Same as for cannon except Type 4 message is used.

(a) See a(3)a above.

(b) See a(3)b above.

(c) See a(3)c above.

(d) See a(3)d above.

(3) Survey data (Sample Fig 33).

(a) Maximum of 5 elements or lines. Up to 24 alphanumeric characters per line.

(b) There are 91 characters in an average survey report. The maximum survey report would require not more than 91 characters.

(c) The number of these reports will depend on the tactical situation. A reasonable estimate would be 24 each 24-hour period.

(d) Average time to transmit this report is 10 seconds.

(4) Observer's report (Sample Fig 34).

(a) Maximum of 8 elements or lines. Up to 41 alphanumeric characters per line.

(b) There are 131 characters in an average observer's report. The maximum observer's report would require not more than 1423 characters.

(c) The number of these reports will depend on the tactical situation. A reasonable estimate would be 3 each 24-hour period.

(d) Average time to transmit this report is 30 seconds.

(5) State of Readiness chart

(a) Positions (Sample Fig 35, Form Fig 35a)

1. Maximum of 17 elements or lines, up to 27 alpha-numeric characters per line.

2. There are 298 characters in an average Readiness chart. The maximum State of Readiness Chart-Positions would require not more than 454 characters.

3. The number of these reports will depend on the tactical situation. A reasonable estimate would be 12 each 24-hour period.

4. Average time to transmit this report is 80 seconds.

(b) Ammunition (Sample Fig 36, Form Fig 36a)

1. Maximum of 18 elements or lines. Up to 73 alphanumeric characters per line.

2. There are 422 characters in an average Readiness Chart-Ammunition. The maximum State of Readiness Chart-Ammunition would require not more than 1234 characters.

3. The number of these reports will depend on the tactical situation. A reasonable estimate would be 32 each 24-hour period.

4. Average time to transmit this report is 40 seconds.

p. Sergeant battalion FDC.

See II5i(5)(c).

q. Pershing battalion FDC.

See II5i(5)(e)

2. OUTPUT.

a. From Cannon Battery FDC.

(1) Executive's Report (Sample Fig 12).

(a) See 1b(7)(a) above.

(b) See 1b(7)(b) above.

(c) The number of these reports will depend on the tactical situation. A reasonable estimate would be 2 reports each 24-hour period..

(d) See 1b(7)(d) above.

(2) Report of targets fired on. (Sample Fig 11).

(a) See 1b(6)(a) above.

(b) See 1b(6)(b) above.

(c) The number of these transmissions will depend on the tactical situation and the organization for combat. A reasonable estimate would be 10 transmissions each 24-hour period.

(d) See 1b(6)(d) above.

(3) Fire for effect data (Sample Fig 5).

(a) See 1a(1)(e)1 above.

(b) See 1a(1)(e)2 above.

(c) The number of transmissions will depend on the tactical situation. A reasonable estimate would be 5 each 24-hour period.

(d) See 1a(1)(e)4 above.

(4) Data for replot (Sample Fig 6, Form Fig 1a).

(a) See 1a(4)(a) above.

(b) See 1a(4)(b) above.

(c) See 1a(4)(c) above.

(d) See 1a(4)(d) above.

b. From Cannon battalion FDC.

(1) Fire order (Sample Fig 6, Form Fig 1a).

(a) See 1a(2)(a) above.

(b) See 1a(2)(b) above.

(c) The number of these orders will depend on the tactical situation. A reasonable estimate would be 30 orders each 24-hour period.

(d) See 1a(2)(d) above.

(2) Time on target (Sample Fig 4, Form Fig 1a).

(a) See 1a(1)(d)1 above.

(b) See 1a(1)(d)2 above.

(c) The number of these will depend on the tactical situation. A reasonable estimate would be 12 each 24-hour period.

(d) See 1a(1)(d)4 above.

(3) Metro messages (Sample Fig 7, Form Fig 7a).

(a) See 1a(3)(a) above.

(b) See 1a(3)(b) above.

(c) See 1a(3)(c) above.

(d) See 1a(3)(d) above.

(4) Request for additional fire (Sample Fig 13).

(a) See 1c(2)(a) above.

(b) See 1c(2)(b) above.

(c) The number of these requests will depend on the tactical situation. A reasonable estimate would be 2 each 24-hour period.

(d) See 1c(2)(d) above.

(5) Fire for effect data (Sample Fig 5).

(a) See 1a(1)(e)1 above.

(b) See 1a(1)(e)2 above.

(c) See 1a(1)(e)3 above.

(d) See 1a(1)(e)4 above.

(6) Survey data (Sample Fig 9).

(a) See 1a(5)(a) above.

(b) See 1a(5)(b) above.

(c) The number of these transmissions will depend on the tactical situation and the organization for combat. A reasonable estimate would be 3 each 24-hour period.

(d) See 1a(5)(d) above.

(7) Fire capabilities (Sample Fig 14).

(a) See 1c(3)(a) above.

(b) See 1c(3)(b) above.

(c) The number of these transmissions will depend on the tactical situation. A reasonable estimate would be 1 each 24-hour period.

(d) See 1c(3)(d) above.

(8) Battery data sheet (Sample Fig 3).

(a) See 1a(1)(c)1 above.

(b) See 1a(1)(c)2 above.

(c) The number of data sheets will depend on the tactical situation. A reasonable estimate would be 3 each 24-hour period.

(d) See 1a(1)(c)4 above.

(9) Replot data (Sample Fig 3, Form Fig 1a).

(a) See 1a(4)(a) above.

(b) See 1a(4)(b) above.

(c) The number of these transmissions will depend on the tactical situation. A reasonable estimate would be 15 each 24-hour period.

(d) See 1a(4)(d) above.

(10) Fire commands to batteries (Sample Form Fig 1a).

(a) See 1a(6)(a) above.

(b) See 1a(6)(b) above.

(c) The number of these transmissions will depend on the tactical situation and the organization for combat. A reasonable estimate would be 6 each 24-hour period.

(d) See 1a(6)(d) above.

c. From Division Artillery FDC.

(1) Fire missions to subordinate units.

(a) Fire mission (Sample Fig 10, Form Fig 1a).

1. See 1b(2)(a)1 above.

2. See 1b(2)(a)2 above.

3. The number of these missions will depend on the tactical situation. A reasonable estimate would be 4 each 24-hour period.

4. See 1b(2)(a)4 above.

(b) Time on target (Sample Fig 4, Form Fig 1a).

1. See 1a(1)(d)1 above.

2. See 1a(1)(d)2 above.

3. The number of these missions will depend on the tactical situation. A reasonable estimate would be 1 each 24-hour period.

4. See 1a(1)(d)4 above.

(2) Request for additional fire (Sample Fig 13).

(a) See 1c(2)(a) above.

(b) See 1c(2)(b) above.

(c) The number of these requests will depend on the tactical situation and the organization for combat. A reasonable estimate would be 1 each 72-hour period.

(d) See 1c(2)(d) above.

(3) Metro message (Sample Fig 7, Form Fig 7a).

(a) See 1a(3)(a) above.

(b) See 1a(3)(b) above.

(c) See 1a(3)(c) above.

(d) See 1a(3)(d) above.

d. From Corps Artillery FDC.

(1) Fire missions to subordinate units.

(a) Fire missions (Sample Fig 10, Form Fig 1a).

1. See 1b(2)(a)1 above.

2. See 1b(2)(a)2 above.

3. The number of these missions will depend on the tactical situation. A reasonable estimate would be 20 each 24-hour period.

4. See 1b(2)(a)4 above.

(b) Time on target (Sample Fig 4, Form Fig 1a).

1. See 1a(1)(d)1 above.

2. See 1a(1)(d)2 above.

3. The number of these missions will depend on the tactical situation. A reasonable estimate would be 10 each 24-hour period.

4. See 1a(1)(d)4 above.

(2) Request for additional fire (Sample Fig 13)

(a) See 1c(2)(a) above.

(b) See 1c(2)(b) above.

(c) The number of these requests will depend on the tactical situation and the organization for combat. A reasonable estimate would be 1 each 48-hour period.

(d) See 1c(2)(d) above.

(3) Metro messages (Sample Fig 7, Form Fig 7a)

(a) See 1a(3)(a) above.

(b) See 1a(3)(b) above.

(c) See 1a(3)(c) above.

(d) See 1a(3)(d) above.

e. From Artillery Group FDC.

(1) Fire missions to subordinate units

(a) Fire missions (Sample Fig 10, Form Fig 1a).

1. See 1b(2)(a)1 above.

2. See 1b(2)(a)2 above.

3. The number of these missions will depend on the tactical situation. A reasonable estimate would be 30 each 24-hour period.

4. See 1b(2)(a)4 above.

(b) Time on target (Sample Fig 4, Form Fig 1a).

1. See 1a(1)(d)1 above.

2. See 1a(1)(d)2 above.

3. See 1a(1)(d)3 above.

4. See 1a(1)(d)4 above.

(2) Request for additional fire (Sample Fig 13)

(a) See 1c(2)(a) above.

(b) See 1c(2)(b) above.

(c) See 1c(2)(c) above.

(d) See 1c(2)(d) above.

(3) Fire capabilities (Sample Fig 14)

(a) See 1c(3)(a) above.

(b) See 1c(3)(b) above.

(c) The number of these transmissions will depend on the tactical situation. A reasonable estimate would be 1 each 24-hour period.

(d) See 1c(3)(d) above.

f. From Army FDC.

(1) Fire missions to subordinate units

(a) Fire mission (Sample Fig 10, Form Fig 1a).

1. See 1b(2)(a)1 above.

2. See 1b(2)(a)2 above.

3. See 1b(2)(a)3 above.

4. See 1b(2)(a)4 above.

(b) Time on target (Sample Fig 4, Form Fig 1a).

1. See 1a(1)(d)1 above.

2. See 1a(1)(d)2 above.

3. See 1a(1)(d)3 above.

4. See 1a(1)(d)4 above.

g. From rocket battery FDC (Composite battalion only there is no battery FDC in an Honest John battalion).

(1) Fire order (Sample Fig 16, Form Fig 15a).

(a) See 1h(2)(a).

(b) See 1h(2)(b).

(c) See 1h(2)(c).

(d) See 1h(2)(d).

(2) Warning order (Sample Fig 37, Form Fig 15a).

(a) Maximum of 6 elements or lines. Up to 30 alphanumeric characters per line.

(b) There are 80 characters in an average order The maximum order would require not more than 120 characters.

(c) The number of these orders will depend on the number of fire missions. A reasonable estimate would be 6 orders each 24-hour period.

(d) Average time to transmit this order is 60 seconds.

(3) Orienting data (Sample Fig 38, Form Fig 15a and 38a).

(a) Maximum of 3 elements or lines. Up to 20 alphanumeric characters per line.

(b) There are 54 characters in an average transmission. The maximum transmission would require not more than 54 characters.

(c) The number of these transmissions will depend on the number of fire missions. A reasonable estimate would be 6 transmissions each 24-hour period

(d) Average time to transmit these data is 30 seconds.

(4) Corrected firing data (Sample Fig 39, Form Fig 15a and 38a).

(a) Maximum of 3 elements or lines. Up to 32 alphanumeric characters per line.

(b) There are 66 characters in an average transmission. The maximum transmission would require not more than 66 characters.

(c) The number of these transmissions will depend on the number of fire missions. A reasonable estimate would be 6 transmissions each 24-hour period.

(d) Average time to transmit these data is 30 seconds.

h. From rocket battalion FDC.

(1) Fire order (Sample Fig 16, Form Fig 15a).

(a) See 1h(2)(a).

(b) See 1h(2)(b).

(c) See 1h(2)(c).

(d) See 1h(2)(d).

(2) Warning order (Sample Fig 37, Form Fig 15a)

(a) See 2g(2)(a).

(b) See 2g(2)(b).

(c) The number of these orders will depend on the number of fire missions. A reasonable estimate would be 12 orders each 24-hour period.

(d) See 2g(2)(d).

(3) Orienting data (Sample Fig 38, Form Fig 15a and 38a)

(a) See 2g(3)(a).

(b) See 2g(3)(b).

(c) The number of these transmissions will depend on the number of fire missions. A reasonable estimate would be 12 transmissions each 24-hour period.

(d) See 2g(3)(d).

(4) Corrected firing data (Sample Fig 39, Form Fig 15a and 38a)

(a) See 2g(4)(a).

(b) See 2g(4)(b).

(c) The number of these transmissions will depend on the number of fire missions. A reasonable estimate would be 12 transmissions each 24-hour period.

(d) See 2g(4)(d).

i. From Division Artillery FDC

(1) Atomic fire order (Sample Fig 20).

(a) See 1i(1)(a).

(b) See 1i(1)(b).

(c) The number of these orders will depend on the tactical situation. A reasonable estimate would be 6 orders each 24-hour period.

(d) See 1i(1)(d).

NOTE: See equivalent input for each system stated as fire mission. Non-atomic fire order omits unnecessary elements.

(2) Target list (Sample Fig 21).

(a) See 1i(2)(a).

(b) See 1i(2)(b).

(c) See 1i(2)(c).

(d) See 1i(2)(d).

(3) Atomic fire request (Sample Fig 22).

(a) See 1i(3)(a).

(b) See 1i(3)(b).

(c) The number of these requests will depend on the tactical situation. A reasonable estimate would be 11 requests each 24-hour period.

(d) See 1i(3)(d).

NOTE: Non-atomic fire request omits unnecessary elements.

j. From Corps Artillery FDC

(1) Atomic fire order (Sample Fig 20).

(a) See 1i(1)(a).

(b) See 1i(1)(b).

(c) The number of these orders will depend on the tactical situation. A reasonable estimate would be 22 orders each 24-hour period.

(d) See 1i(1)(d).

NOTE: See equivalent input for each system stated as fire mission.

(2) Target list (Sample Fig 21).

(a) See 1i(2)(a).

(b) See 1i(2)(b).

(c) See 1i(2)(c).

(d) See 1i(2)(d).

(3) Atomic fire request (Sample Fig 22).

(a) See 1i(3)(a).

(b) See 1i(3)(b).

(c) The number of these requests will depend on the tactical situation. A reasonable estimate would be 10 requests each 24-hour period.

(d) See 1i(3)(d).

k. From Artillery Group FDC.

(1) Atomic fire order (Sample Fig 20).

(a) See 11(1)(a).

(b) See 11(1)(b).

(c) The number of these orders will depend on the tactical situation. A reasonable estimate would be 10 orders each 24-hour period.

(d) See 11(1)(d).

NOTE: See equivalent input for each system stated as fire mission.

(2) Target list (Sample Fig 21).

(a) See 11(2)(a).

(b) See 11(2)(b).

(c) See 11(2)(c).

(d) See 11(2)(d).

l. From Army Artillery.

(1) Atomic fire order (Sample Fig 20).

(a) See 11(1)(a).

(b) See 11(1)(b).

(c) The number of these orders will depend on the tactical situation. A reasonable estimate would be 12 orders each 24-hour period.

(d) See 11(1)(d).

NOTE: See equivalent input for each system stated as fire mission.

(2) Target list (Sample Fig 21).

(a) See 11(2)(a).

(b) See 11(2)(b).

(c) See 11(2)(c).

(d) See 11(2)(d).

m. From Corporal battalion FDC.

(1) FDO fire order (Sample Fig 40, Form Fig 23a).

(a) Maximum of 13 elements or lines. Up to 38 alphanumeric characters per line.

(b) There are 314 characters in an average FDO fire order. The maximum fire order would require not more than 314 characters.

(c) The number of these orders will depend on the tactical situation. A reasonable estimate would be 6 each 24-hour period.

(d) Average time to transmit this FDO fire order is 90 seconds.

(2) Fire commands (Sample Fig 41, Form Fig 41a).

(a) Maximum of 93 elements or lines. Up to 68 alphanumeric characters per line.

(b) There are 1950 characters in the average fire command sheet. The maximum fire command sheet would require not more than 1950 characters.

(c) The number of these commands will depend on the tactical situation. A reasonable estimate would be 6 each 24-hour period.

(d) Average time to transmit the fire command sheet is 400 seconds.

n. From Redstone battalion FDC.

(1) Fire command sheet (Sample Fig 42).

(a) Maximum of 8 elements or lines. Up to 274 alphanumeric characters per line.

(b) There are 387 characters in an average fire command sheet. The maximum fire command sheet would require not more than 387 characters.

(c) The number of these fire command sheets will depend on the tactical situation. A reasonable estimate would be 4 each 24-hour period.

(d) Average time to transmit this fire command sheet is 200 seconds.

o. From Lacrosse battalion FDC.

(1) Warning order (Sample Fig 43).

(a) Maximum of 7 elements or lines. Up to 27 alphanumeric characters per line.

(b) There are 110 characters in an average warning order. Warning order would require not more than 110 characters.

(c) The number of warning orders will depend on the tactical situation. A reasonable estimate would be 32 each 24-hour period.

(d) Average time to transmit this warning order is 20 seconds.

(2) Second phase order (Sample Fig 44).

(a) Maximum of 5 elements or lines. Up to 24 alphanumeric characters per line.

(b) There are 86 characters in an average second phase order. The maximum second phase order would require not more than 86 characters.

(c) The number of these second phase orders will depend on the tactical situation. A reasonable estimate would be 37 each 24-hour period.

(d) Average time to transmit this second phase order is 20 seconds.

(3) Guidance settings (Sample Fig 45).

(a) Maximum of 11 elements or lines. Up to 32 alphanumeric characters per line.

(b) There are 201 characters in an average guidance settings record. The maximum characters in a guidance settings record would require not more than 201 characters.

(c) The number of these guidance settings records will depend on the tactical situation. A reasonable estimate would be 32 each 24-hour period.

(d) Average time to transmit a guidance settings record is 60 seconds.

p. Sergeant battalion FDC.

See II5i(5)(c).

q. Pershing battalion FDC.

See II5i(5)(e).

3. FILES.

a. No formal files, as such, are kept pertaining to technical fire control input/output information. Temporary records of all forms listed are maintained at battalion level and above, information from temporary records are included in:

(1) S3 journal. The S3 journal is a section journal in which all incidents, messages, and orders affecting the S3 section are recorded with an entry describing the action taken, if any. Copies of messages and orders sent and received and the record of fire missions are attached to and become a part of the S3 journal. At specific intervals the journal is closed and made a part of the unit journal.

(2) Record of fire missions. The record of fire missions is a locally reproduced record which shows each fire mission handled by the FDC. It includes for each target the concentration number, source, description, location, unit(s) firing, time fired, type and amount of ammunition fired, estimated effect, and other appropriate information.

(3) Periodic operations report. The periodic operations report is a report which summarizes unit activities. It is submitted daily or as prescribed by the commander. The form is normally prescribed by the commander. Any item noted in the periodic operations report will also be noted in the S3 journal. Therefore, the periodic operations report is a summary of the S3 journal.

(4) Command report. The command report is a periodic narrative summary of events from the point of view of the commander. It is a medium through which the commander may record, review, and evaluate the overall activities of his command. The report is prepared under the supervision of the S3 but must be signed by the organization commander (SR 525-45-1).

b. In any proposed system, provision will have to be made for storage and display of many of the items now maintained as temporary records. (See section V).

Figure 1
The Fire Request

The Fire Request

Fire request			Examples				
Element	When omitted	When announced	1. Precision registration using surveyed chart	2. Area mission using polar plot	3. Destruction mission using reference point shift	4. Area mission using prearranged data	5. Area mission firing high-angle fire
a. Identification of observer	Never	Always	THUNDER 18, THIS IS THUNDER 48.	STALLION 18, THIS IS STALLION 48.	COMPOUND 18, THIS IS COMPOUND 48.	KANVAROD 18, THIS IS KANVAROD 48.	RAMROD 18, THIS IS RAMROD 48.
b. Warning	Never	Always	FIRE MISSION	FIRE MISSION	FIRE MISSION	FIRE MISSION	FIRE MISSION.
c. Location of target	Never	Always	REGISTRATION POINT 2, AZIMUTH 4700.	AZIMUTH 5360, DOWN 30, DISTANCE 3200.	FROM REGISTRATION POINT 1, AZIMUTH 2610, RIGHT 300, UP 25, DROP 800.	CONCENTRATION AB 302, AZIMUTH 3062.	COORDINATES 742134, AZIMUTH 4730.
d. Azimuth							
e. Location of target by shift							
f. Nature of target	In precision registration	When other than precision registration is desired.	Omitted	20 INFANTRY IN THE OPEN.	BUNKER	5 TANKS AND COMPANY OF INFANTRY IN THE OPEN.	MACHINE GUN FIRING.
g. Classification of fire	When target is deep	Optional when target is close.	Omitted	Omitted	Omitted	Omitted	CLOSE SIC.
h. Type of adjustment.							
(1) Type of fire	Area of fire	Precision	REGISTRATION	Omitted	DESTRUCTION	Omitted	Omitted.
(2) Trajectory	Low-angle fire	High-angle fire	Omitted	Omitted	Omitted	Omitted	HIGH ANGLE
(3) Method of fire	(a) In precision fire	When any method other than two piece volleys is desired in area fire.	Omitted	SALVO LEFT	Omitted	Omitted	Omitted.
	(b) When 2 piece volleys are desired.						
	(c) In FFE mission						
(4) Distribution	(a) When normal sheaf is desired.	When firing other than normal sheaf in area fire.	Omitted	Omitted	Omitted	Omitted	CONVERGED SHEAF.
	(b) In precision fire						
(5) Volume FFE	When applicable	When applicable	Omitted	Omitted	Omitted	REQUEST BATTALION.	Omitted.
i. Type of projectile	When shell HE is desired	When other than shell HE is desired.	Omitted	Omitted	Omitted	SHELL HE AND WP.	Omitted.
j. Fuze action	(1) When Fuze Q is desired. (2) When HC smoke or illuminating shell is requested.	When any fuze other than Fuze Q is desired for shell HE.	Omitted	FUZE TIME	Omitted	Omitted	FUZE VT.
k. Control	Never	Always	WILL ADJUST	WILL ADJUST	WILL ADJUST	FIRE FOR EFFECT.	WILL ADJUST.
IMMEDIATE RESULTS OF INITIAL FIRE REQUEST			(Observer will get 1-piece, low-angle, precision, shell HE, fuze Q.)	(Observer will get 2-piece salvos from the left, low-angle, regular sheaf, shell HE, fuze T.)	(Observer will get 1-piece, low-angle, precision, shell HE, fuze Q.)	(Observer will get area fire, low-angle, normal sheaf, shell HE and WP, fuze Q, no FFE.)	(Observer will get area fire, high-angle, 2-piece volleys, converged sheaf, shell HE, fuze Q in adjustment, fuze VT in effect.)

FDC COMPUTER'S RECORD

(FM 6-40)

Battery	Time mission Received	Completed	Date	Concentration number

Fire mission	Correction	Initial fire commands
	Deflection	Adjust, Sp corr
	Range	Sh Lot
FDO order Alt_____, _____, MF_____, _____, Sp corr_____, _____, Sh_____, Lot_____, Chg_____, Fz_____, _____, _____, _____, Conc nr_____	Site	Chg Fz
		MF
		Corr Df
		Si
		Ti
	100/R	El
		QE

Observer Corrections			Subsequent fire commands										
Dev	Height	Rg	Fz, MF	Corr	Chart df	Piece df	Rg	HB Corr	Si	Ti	El	QE	Ammo exp

Data for replot

Coordinates	Altitude	Fuze	Concentration number

Ammunition

Type								
Total								
Received								
On hand								
Expended								
Remaining								

Form Figure 1a
FDC Computer's Record

SUBSEQUENT FIRE REQUESTS

Element	When announced	Examples
(1) OT azimuth	When azimuth deviates from announced azimuth by more than 100 mils.	AZIMUTH 5840
(2) Deviation	If change is desired.	RIGHT (LEFT) (SO MUCH) (nearest 10 yards)
(3) Height of burst	" " " "	UP (DOWN) (SO MUCH) (nearest 5 yards)
(4) Trajectory	" " " "	HIGH (LOW) ANGLE
(5) Method of fire	" " " "	SALVO (RIGHT) (LEFT)
(6) Distribution	" " " "	CONVERGED SHEAF
(7) Shell	" " " "	SHELL (WP) (SMOKE)(ETC)
(8) Fuze	" " " "	FUZE (VT) (TIME) (ETC)
(9) Range	Always.	(ADD) (DROP) (REPEAT) RANGE
(10) Control	If change is desired.	(AT MY COMMAND) (FIRE WHEN READY)

Figure 2
Subsequent Fire Requests

FIRING BATTERY DATA SHEET

(FM 6-40)

Battery	Coordinates	Altitude of battery	Time	Date	Page number

Chart data									Fire commands									
Conc nr	Coordinates	Time		Time of flight (sec)	Deflection		Range	Alt / Diff alt / Ht of burst	Angle of site / Comp site	Sp corr / Sh / Lat	Chg / Fz / MF	Corr / Df — Individual sheaf correction		Si — Indiv corr	Ti — Indiv corr	Zone	El or QE	Remarks
		From	To		Corr	Chart df	Et											

Figure 3
Firing Battery Data Sheet

TIME ON TARGET

THIS IS (CALL SIGE)

FIRE MISSION

FIRE 2 VOLLEYS

SHELL HE

FUZE QUICK

COORDINATES 65432 36183

ALTITUDE 420

CENTER RANGE

TOT, TOT WILL BE 8 MINUTES FROM NOW

Figure 4
Time On Target

FIRE FOR EFFECT LOCATION

THIS IS (CALL SIGN)

FIRE FOR EFFECT LOCATION

COORDINATES (5789 3654)

ALTITUDE (516)

Figure 5

Fire For Effect Location

FIRE ORDER

	Element	When announced	Command
(1)	Altitude	Always	ALTITUDE 412 YARDS
(2)	Battery(ies) to fire	Always	BATTALION
(3)	Adjusting battery	When applicable	BRAVO
(4)	Method of fire of adjusting battery	When different from observer's request or standard procedure; i.e., volley fire.	SALVO RIGHT
(5)	Basis for corrections	When applicable	USE REGISTRATION POINT 2
(6)	Use of special corrections	When applicable	SPECIAL CORRECTIONS, CONVERGED SHEAF
(7)	Projectile	When different from observer's request or standard procedure; i.e., shell HE.	SHELL WP
(8)	Ammunition lot	When applicable	LOT _____
(9)	Charge	Always, except for high-angle fire	CHARGE 5
(10)	Fuze	When different from observer's request or standard procedure; i.e., fuze quick.	FUZE DELAY
(11)	Number of volleys	Always	5 VOLLEYS
(12)	Range spread or zone	When different from observer's request or standard procedure; i.e., center range.	ONE C APART
(13)	Time of opening fire	When different from observer's request or standard procedure; i.e., when ready.	AT MY COMMAND
(14)	Concentration number	Always	CONCENTRATION ALFA BRAVO 101

Figure 6
Fire Order

MET MESSAGE

(1)	(2)
Example of Met Message	**Explanation**
MIF12 08304	**The first symbol is always the letter M; the letters IF are the code designation of a particular sending station. The figures 12, which complete the first group, indicate that the MDP is 1200 feet above sea level. In the second group of the first line, the first four figures give the time of the last observation, 0830. The last figure, 4, gives the type of message.**

	(3) Standard Altitude No.	(4) Height ft	(5) Wind Direction mils	(6) Wind Speed MPH	(7) Density %	(8) Temperature °F.
02110 95774	0	0	2100	10	95.7	74
12217 95674	1	600	2200	17	95.6	74
22322 95476	2	1500	2300	22	95.4	76
32421 95479	3	3000	2400	21	95.4	79
42523 95579	4	4500	2500	23	95.5	79
52625 95785	5	6000	2600	25	95.7	85
62926 95985	6	9000	2900	26	95.9	85
73226 96185	7	12000	3200	26	96.1	85
83429 96285	8	15000	3400	29	96.2	85
93530 96385	9	18000	3500	30	96.3	85
03732 96485	10	24000	3700	32	96.4	85
13833 96285	11	30000	3800	33	96.2	85

The first figure in each line is the line-number, Column (3), and determines the standard altitude, Column (4), at which the line is applicable. See Tables L. The relation between line number and altitude is the same in all messages. It is extended when neeessary beyond the numbers and altitudes of the example by increasing the altitude always in steps of 6000 feet per line.

The second and third figures give the azimuth, Column (5), of the direction from which the ballistic wind blows measured clockwise from Y-north in hundreds of mils.

The fourth and fifth figures give the velocity of the ballistic wind in miles per hour, Column (6).

In the second group, the first three figures with the decimal point tacitly understood give the ballistic density to the nearest tenth of a per cent reckoned from the standard for the altitude. When the density is 100.0 per cent or greater, the first digit is dropped, 023 meaning a density of 102.3 per cent or 2.3 per cent above standard. The figures 957 mean 95.7 per cent or 4.3 per cent below standard. When visual (rather than electronic) methods are employed to obtain the meteorological message the ballistic densities are reported to the nearest whole per cent; with the tenths column being filled with the letter "X" for line 1 and all higher lines.

The last two figures of each line give the ballistic temperature in degrees Fahrenheit. When the temperature is 100 degrees or higher, the first digit is dropped. Thus 102°F. and 2°F. are both coded as 02. There is no real ambiguity in this, for near the surface the user can always distinguish between the two possible meanings by his own observation, and for temperatures aloft he can select the correct meaning merely by avoiding an unreasonable jump between consecutive standard altitudes. If any temperatures are negative, a note to that effect appears at the end of the message.

Figure 7
Met Message

METEOROLOGICAL MESSAGE
(TM 6-242)

STATION				LOCATION					
DATE				RELEASE TIME (L. S. T.)			FLIGHT NO.		
0									
1									
2									
3									
4									
5									
6									
7									
8									
9									
0									
1									
2									
3									
4									
5									
6									
REMARKS									
☐ DELIVERED TO ☐ RECEIVED FROM							TIME		
MESSAGE NUMBER				DATE					
RECORDER				CHECKER					

Form Figure 7a
Meteorological Message

DATA FOR REPLOT

THIS IS (CALL SIGN)

DATA FOR REPLOT

COORDINATES (5763 4318)

ALTITUDE (351)

FUZE QUICK

CONCENTRATION (AB102)

Figure 8
Data For Replot

SURVEY DATA

COORDINATES OF BATTERIES

A - (37584 36123) ALTITUDE(410)

B - (37476 35912) ALTITUDE(400)

C - (37615 35810) ALTITUDE(415)

O1 (39476 40180) ALTITUDE(515)

O2 (34785 67890) ALTITUDE(420)

REGISTRATION POINT 1(47165 39480) ALTITUDE(450)

ORIENTING ANGLE (1420) AZIMUTH (800)

Figure 9
Survey Data

FIRE MISSION FROM HIGHER
HEADQUARTERS

THIS IS (CALL SIGN)

FIRE MISSION

FIRE (5) VOLLEYS

SHELL (HE)

FUZE QUICK

APPROXIMATE COORDINATES (4850 3675)

CENTER RANGE (or RANGE SPREAD)

WHEN READY (or AT MY COMMAND)

ADJUSTED COORDINATES LATER

CONCENTRATION (AB401)

After adjustment is complete adjusted coordinate are transmitted to units concerned.

ADJUSTED COORDINATES (4785 3672)

ALTITUDE (478)

CONCENTRATION (AB401)

Figure 10
Fire Mission From Higher Headquarters

REPORT OF TARGETS FIRED ON

THIS IS (CALL SIGN)

FIRED 5 VOLLEYS

COORDINATES (3678 5764)

INFANTRY COMPANY DIGGING IN

ESTIMATE 20 CASUALTIES

Figure 11
Report of Targets Fired On

EXECUTIVE'S REPORT

Element	When Announced	Examples
(1) State of readiness	Always	BATTERY IS LAID
(2) Orientation of pieces	"	AZIMUTH (ORIENTING ANGLE) (SO MUCH)
(3) Basis of reference for sighting purposes	"	DEFLECTION (SO MUCH)
(4) Elevation to clear visible masks	"	MINIMUM ELEVATION(S), CHARGE (SO-AND-SO) (SO MUCH)
(5) Layout of pieces	"	DISTRIBUTION OF PIECES, NR 1 (SO MANY) YARDS RIGHT (LEFT) (SO MANY) YARDS BEHIND (AHEAD OF) BATTERY CENTER; NR 2 (ETC)
(6) Amount, type, lot numbers, and weight of projectiles	When directed	(SO MANY) HE LOT NUMBER (SO-AND-SO) FUZE (TYPE) (SO MANY) WEIGHT (SO MUCH) (SO MANY) (ETC)
(7) Temperature of powder	When directed	POWDER TEMPERATURE (SO MANY DEGREES)
(8) On carriage capabilities	When directed	LATERAL LIMITS AZIMUTH (DEFLECTION) (SO MUCH) TO AZIMUTH (DEFLECTION) (SO MUCH)
(9) Maximum high angle elevation	When directed	MAXIMUM ELEVATION (SO MUCH)
(10) Visible aiming points	When directed	(DESCRIPTION), DEFLECTION (SO MUCH) DISTANCE (SO MUCH)

Form Figure 12
Executive's Report

REQUEST FOR ADDITIONAL FIRE

THIS IS (name or number) BATTALION

NOW ADJUSTING (OR FIRING) ON (nature of Target)

SIZE OF AREA (may be omitted)

APPROXIMATE COORDINATES (4780 3670)

ALTITUDE (476)

REQUEST ADDITIONAL FIRE

CONCENTRATION NUMBER (A3401)

Adjusting battalion completes adjustment replots target and sends the following message.

ADJUSTED COORDINATES (4785 3672)

ALTITUDE (478)

NOW FIRING FOR EFFECT

CONCENTRATION (A3401)

Figure 13
Request For Additional Fire

FIRE CAPABILITIES

THIS IS (CALL SIGN)

BATTALION CENTER COORDINATES (4732 1845)

BATTALION CENTER LINE AZIMUTH (5000)

Figure 14
Fire Capabilities

FIRE MISSION

Element	Example
1. Identification	THIS IS DANGER 14
2. Warning	FIRE MISSION
3. Number of rockets	1 ROCKET
4. Warhead	NUCLEAR (SO MANY KILOTONS)
5. Fuze	FUZE TIME
6. Location	COORDINATES 12345.6-67876.6 ALTITUDE 387.5
7. Height of Burst	HOB (SO MANY FEET)
8. Method of fire	1 LAUNCHER
9. Predicted time of fire	1 ROUND 0200
10. Concentration	CONC NR EF 102

Figure 15
Fire Mission

COMPUTER'S RECORD
(762-mm rocket)

Unit	Date	Conc Nr

FIRE MISSION	POSITION DATA		FIRE COMMANDS	
	Rkt Ser Nr		WARNING ORDER	
	Prop Wt	lb	Launcher Nr	
	Empty Wt	lb	Firing Point	
	Az of OL	m	Warhead	
	+ 6400 if necessary		Fuze	
	Sum		Method of Fire	
	Az of Fire	m	Predicted Time	
	Orienting Angle	m	INITIAL LAYING DATA	
FDO ORDER	Aiming Post Df	m	Orienting Angle	m
	Df Shift	m	Quadrant El	m
	Tgt Df	m	Azimuth	m
	Sur Wind Corr Df	m	COMPUTED DATA	
Tgt Coord	Df Fired	m	Corrected Df	m
Launcher Coord	Sur Wind Corr	m	Time	sec
dE - dN	El Fired	m	Corrected Quadrant El	m

AZIMUTH		RANGE		HEIGHT	
Log dE - Log dN = Log Tan B		Log dE - Log sin B = Log D*		Tgt Ht	M
Log dE		Log dE		Burst Ht	M
Log dN		Log Sin B		Total Ht	M
Log Tan B		Log D		Launcher Ht	M
Bearing	m	D (Range)	M	(above) Burst below Launcher	M
Azimuth	m			Launch Ht	M
Time Mission Fired		*If dN dE use formula: Log dN - Log CosB = Log D		(Nearest 100 ft) Launcher Ht	ft
				(Meters x 3.281 = ft)	

Surveillance:

FS FORM 375
3 JAN 57

ARMY-FT. SILL, OKLA.

Form Figure 15.
Computer's Record

FIRE ORDER

Element	Example
1. Launcher(s) to fire	LAUNCHER NR 2
2. Firing point(s)	FIRING POINT 1
3. Concentration	EF 102

Figure 16
Fire Order

LAUNCHING PLATOON COMMANDER'S REPORT

(For each Launcher-Rocket Combination)

Element	Example
1. Launcher Number	Launcher Number 1
2. State of readiness	Launchers are Laid
3. Orientation of pieces	Azimuth (Orienting Angle) (So Much)
4. Basis of reference for sighting purposes	Deflection (So Much)
5. Deflection Limits	Deflection Limits (Right)(Left) (so many mils)
6. Elevation to clear visible masks	Minimum Elevation (So Much)
7. Rocket Serial Number	Serial Number_____
8. Rocket Empty Weight	Empty Weight (So Many LBs)
9. Rocket Propellant Weight	Propellant Weight (So Many LBs)
10. Rocket Fin Weight	Fin Weight (So Many LBs)
11. Rocket Propellant Temperature	Propellant Temperature(So Many Degrees)
12. Surface Pressure (Barometer)	Surface Pressure (So Many Millions)

NOTE: All elements are always reported for each launcher-rocket combination. Elements 1-10 are reported only initially. Elements 11 and 12 are reported initially and repeated as often as requested or when a significant change occurs.

Figure 17
Launching Platoon Commander's Report

SURVEY SECTION REPORT

Element	Example
1. Coordinates of firing point	Coordinates (So Much)
2. Altitude of firing point	Height (So Many Meters)
3. Azimuth of Orienting Line	Orienting Line (So Many Mils)
4. Latitude	Latitude (So Many Degrees North, South)

Figure 18
Survey Section Report

LOW LEVEL WIND CORRECTION REPORT

Element	Example
Low Level Wind Corrections	Low Level Wind Corrections: Deflection (Right, Left) (So Many MPH) Elevation (Head, Tail) (So Many MPH)

NOTE: Report at firing time less two minutes

Figure 19
Low Level Wind Correction Report

ATOMIC FIRE ORDER

Elements	Example
1. Warning	Fire Mission
2. Coordinates	NP36784596
3. Altitude*	469 Meters
4. H_B (Height of Burst)**	
5. Yield**	
6. Time on target**	
7. Delivery means # **	
8. Safety Limits# **	
9. Fuzing option**	
10. Remarks	(When Necessary)
11. Conc #	ABC79

*Omit for ADM

**Omitted for security reasons (available on request).

Figure 20
Atomic Fire Order

TARGET LIST

Grid Square	Name or Conc Nr	Grid Reference	Alt	Accuracy	Description	Source
*	*	*	*		*	*
3699	EE37	36829908	300	100	Class III dump, 200-yd long, facing east	PCW, PI, Civ Report
*	*	*	*		*	*

NOTE: Estimate 25 targets on each list.

Figure 21
Target List

ATOMIC FIRE REQUEST

Element	Example
1. Warning	Fire Mission
2. Nature of target and damage required	Reserve Inf Assembly Area NP367459 Radius 800 Severe
3. Desired ground zero	14SNP36745986
4. Altitude of desired ground zero	469 Meters
5. Height of burst*	
6. Yield*	
7. Time of burst*	
8. Desired delivery means*	
9. Troop safety requirements*	
10. Type target analysis performed*	
11. Remarks	(When Necessary)
12. Concentration number	AB079

*Omitted for security reasons (available on request).

NOTE: In those cases where an element is not known or not required, it may be omitted. However, the following elements will always be included:

1. Warning.
2. Target description and damage requirement.
3. Desired height of burst.
4. Desired time of burst (May expanded in remarks to show earliest or latest permissible time of burst.
5. Troop safety requirements.
6. Concentration number.

Figure 22
Atomic Fire Request

FIRE MISSION (CORPORAL)

Element	Example
1. Warning	Fire Mission (code name)
2. Target location	4VFF 1562077902 Altitude 195
3. Height of burst*	
4. Yield*	
5. Time on target	250200S
6. Safety limits *	
7. Fuzing option*	
8. Remarks	Surveillance of burst required
9. Concentration number	A26

*Omitted for security reasons (available on request).

Figure 23
Fire Mission (Corporal)

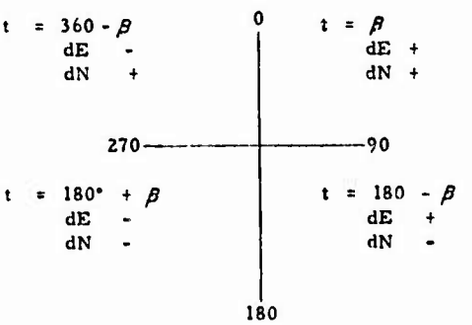
UNIT--------- TIME MISSION ASG---------TIME MISSION COMPLETE----------DATE----------

FIRE MISSION			
Identification			
Type Warhead			
Height of Burst			
Target Coor: Zone		Alt	M
E	N		
Safety Limits			
Over	Left		
Short	Right		
Nature of Tgt			
TOT			
Remarks: ions:			
Conc Nr			

FDO FIRE ORDER			
Section to Fire		Lchr Posn Nr	
Missile Nr			
Radar XMTR FREQ			MC
Trans OSC	Above	Below	
Trans XMTR FREQ			MC
Radar OSC	Above	Below	
Radar Code			
Radar PRF			
Doppler FREQ			
Doppler Code			
Az Guid Term	Early	Late	
Radar Trans Term	Yes	No	
Conc Nr			

FUZE SETTINGS		
1	Height of Burst	ft
2	Alt of Tgt (3.281 x M = ft)	ft
3	Constant	3000 ft
4	Ht (TM 39 - C 7.3 - 70) (Classified Nr.)	ft
5	Classified = (2) + (3) + (4) =	ft

Note 1



FS Form 431
(Gunn) Rev 20 Nov 57

BASIC DATA			
Radar Location			
Lat		Long	
Zone		Alt	M
E	N		
Nr ___ Lch Location			
Nr ___		Alt	M
Az Lchr OL Nr			₥
Rn and Az Rad to Lchr			₥
Nr	Rn	yds Az	₥
Radar Init Az	o		"
Doppler Init Az	o		
Mask Angle			₥
Met Data: (Type 4 Ln 13)			
Wind Dir	₥	Vel	mph

RANGE & AZIMUTH COMPUTATION				
E_2	N_2			
E_1	N_1			
dE	dN			
tan β = dE/dN				
β		°	'	"
β in β or Cos β * =				
t = (Note 1)		°	'	"
*(R_g = dE/Sin β or dN/Cos β, Use dE/Sin when dE > dN)				
R_g =				
$2E_1 + E_2$ =				
(T - t) ** =		±	'	"
(**From nomogram use algebraic sign of product dN ($2E_1 + E_2$ - 1,500,000))				
K = (From nomogram)				
$R_s = R_g/K$				M
T = t ± (T-t)		°	'	"
V = (Az Trans Corr)		°	'	"
Corr T = (T ± V)		°	'	"

AZIMUTH OF FIRE CONVERSION		
1	°x 17.778 =	₥
2	'x .2963 =	₥
3	"x .0049 =	₥
Az of Fire = (1) + (2) + (3) =		₥

Classify CONFIDENTIAL when filled in

Form Figure 23a
Computers Record (Corporal)

BASIC SURVEY DATA (CORPORAL)

Element	
1. Radar Location	
Latitude	57° 20' 30" N
Longitude	147° 30' 20" W
Zone	14 V
Altitude	157 Meters
Easting	625750
Northing	654250
2. Nr 1 Launcher Location	
Nr 1 - Altitude	160 Meter
3. Az OL Launcher Nr 1	2713 mil
4. Rn and Az Rad to Launcher Nr 1	
Range	788 M
Azimuth	4832 mil
5. Radar Init Azimuth	286° 49' 41"
6. Doppler Init Azimuth	287°
7. Mask Angle	146 mil
8. Met Data (Type 4, Line 13)	3218089447
Wind Direction	2100 mil
Wind Velocity	80 MPH

Figure 24
Basic Survey Data (Corporal)

ELEMENTS OF INFORMATION OF AMMUNITION

RECORD, FA MISSILE BN, CORPORAL

Element	Example*
1. Section Number	
2. Missile Number	
3. Radar Transmitter Frequency	
4. Transponder Oscillator Frequency	
5. Radar Local Oscillator Frequency	
6. Transponder Transmitter Frequency	
7. Radar Pulse Repetition Frequency	
8. Radar Code	
9. Radar Code Correction Factors (4)	
10. Radio Beacon Frequency	
11. Radio Beacon Code	
12. State of Readiness Data:	
a. Checked out	
b. Fueled	
c. Warhead mated	
13. Magnetron Frequencies	
14. Beacons:	
a. Number on hand	
b. Fre quency	
c. Code	
15. Warheads:	
a. On hand	
b. Type	

*Classified Confidential when filled in.

Figure 25
Ammunition Record

AMMUNITION RECORD, FA MISSILE BN, CORPORAL

MISSILES

Section nr									
Msl nr									
Radar xmtr									
Trans osc									
Radar osc									
Trans xmtr									
Radar PRF									
Radar code									
Code correction factors	2								
	3								
	4								
	5								
Radio beacon									
Radio code									
Checked									
Fueled									
Warhead									

MAGNETRON FREQ	BEACONS			WARHEADS	
	On hand	Frequency	Code	On hand	Type

Classify CONFIDENTIAL when filled in.

FS FORM (TEST) GUNNERY 429
REV 1 APR 58

711 ARMY-FT. SILL, OKLA.

Form Figure 25a
Ammunition Record (Corporal)

FIRE MISSION (REDSTONE)

Element	Example
1. Identification	Hawk 32
2. Fire mission number	AB211
3. Date and time to fire	061630 April
4. Type warhead*	
5. Height of burst	So Many Feet
6. UTM coordinates (target)	
Grid Zone	17
Easting	532759
Northing	3026489
Altitude	00
7. Nature of target	Division supply point
8. Geographic coordinates (target)	

*Omitted for security reasons (available on request)

Figure 26
Fire Mission (Redstone)

SURVEY DATA (REDSTONE)

Element	Example
1. Firing position	Fox Trot
2. UTM coordinates (Launcher)	
Easting	679194
Northing	3213518
Altitude	00
Grid Zone	17
3. Geographic coordinates (Launcher)	
4. Spheriod	Clarke 1866

Figure 27
Survey Data (Redstone)

STATUS DATA (REDSTONE)

Element	Example
1. Mission assigned to battery	Alpha
2. Missile number	1002
3. Code (date and time completed)*	

*Omitted for Security reasons (available on request).

Figure 28
Status Data (Redstone)

STATUS & READINESS CHART (REDSTONE)

Element	Example
1. Missile number	1001
2. Time to fire	1630 6 Apr 58
3. Ready storage	4 Apr
4. Battery	Bravo
5. Warhead mating*	
6. Horizontal checkout*	
7. Erection completed*	
8. Fuel ALC*	
9. Fuel LOX*	
10. Fuel H_2O_2*	
11. Laying completed*	
12. Vertical check out*	
13. Start LOX topping*	
14. Area cleared	Informed group of status
15. Remarks	at 1500

Figure 29
Status & Readiness Chart (Redstone)

FIRE REQUEST (LACROSSE)

DIRECT METHOD OF FIRE

Element	Example
1. Warning	Fire Mission
2. Identification	Jackpot 15
3. Method of Fire Direction	Direct Tracker Setting 2420 or Azimuth 1965
4. Slant Range	Distance 3000
5. Target Description	Heavy Fortification
6. Warhead	Shaped Change
7. Control	Will Control

Figure 30
Fire Request, Direct Method of Fire (Lacrosse)

FIRE REQUEST (LACROSSE)

OFFSET METHOD OF FIRE
(First Part of Message)

1.	Warning	Fire Mission
2.	Identification	Jackpot 15
3.	Method of Fire	Offset
4.	Direction	Approximate Azimuth 2000
5.	Slant Range	Approximate Distance 3000
6.	Target Description	Infantry Assembly Area
7.	Warhead*	
8.	Control	Will Control

(Second Part of Message)

9.	TSU Angle	OFFSET RIGHT
10.	Slant Range, indicated (TSU to GS)	GSI 1832
11.	Slant Range, Shorter (TSU to GS)	GSL 1802
12.	Slant Range, Greater (TSU to GS)	GSU 2105
13.	Vertical Angle (TSU to GS)	GSV 6386
14.	Slant Range Indicated (TSU to Tgt)	TSL 2701
15.	Slant Range, Shorter (TSU to Tgt)	TSL 2701
16.	Slant Range, Greater (TSU to Tagt)	TSU 3003
17.	Vertical Angle (TSU to Tgt)	TSV 6398
18.	Horizontal Angle (GS to Tgt)	GST 2930
19.	Azimuth (GS to TSU)	AGT 1913

Figure 31
Fire Request, Offset Method of Fire
(Lacrosse)

*Omitted for security reasons (available on request).

FIRE REQUEST (LACROSSE)

OFFSET METHOD OF FIRE
(First Part of Message)

	Element	Example
1.	Warning	Fire Mission
2.	Identification	Jackpot 15
3.	Method Fire	Offset
4.	Direction	Approximate Azimuth 2000
5.	Slant Range	Approximate Distance 3000
6.	Target Description	Infantry Assembly Area
7.	Warhead*	
8.	Control	Will Control

(Second Part of Message)

9.	TSU Angle	OFFSET RIGHT
10.	Slant Range, indicated (TSU to GS)	GSI 1832
11.	Slant Range, Shorter (TSU to GS)	GSL 1802
12.	Slant Range, Greater (TSU to GS)	GSU 2105
13.	Vertical Angle (TSU to GS)	GSV 6386
14.	Slant Range Indicated (TSU to Tgt)	TSL 2701
15.	Slant Range, Shorter (TSU to Tgt)	TSL 2701
16.	Slant Range, Greater (TSU to Tagt)	TSU 3003
17.	Vertical Angle (TSU to Tgt)	TSV 6398
18.	Azimuth (GS to TSU)	AGT 1918
19.	Horizontal Angle (GS to Tgt)	GST 2930

*Omitted for security reasons (available on request)

Figure 31
Fire Request, Offset Method of Fire
(Lacrosse)

(FIRE REQUEST (LACROSSE)

UNOBSERVED FIRE

Element	Example
1. Warning	Fire Mission
2. Identification	King Pin 3
3. Target Coordinates	1256433127495
4. Target Altitude	435 Meters
5. Warhead	T52
6. Height of Burst	1200 Meters
7. Special Instructions	Four Rounds
8. Time	TOT 0857 14 Aug 58

Figure 32
Unobserved Fire (Lacrosse)

SURVEY DATA (LACROSSE)

Element	Example
1. Location	GS ABLE
2. Easting	34567
3. Northing	45678
4. Altitude	227 Meters
5. Orienting Line	2352 Mils

Figure 33
Survey Data (Lacrosse)

OBSERVER'S REPORT (LACROSSE)

Element	Example
1. Guidance Platoon Identification	First Platoon
2. Guidance Position Number or Identification	GS ABLE
3. Coordinates	3350107928
4. Altitude	475 Meters
5. Az of line of known direction or Az to reference points	Az 061825
6. Tracker Reading on Az above	Tracker 1652
7. Mask Clock (6400 mils)	Mask Clock follows Az 100 Mask 30
8. Special information if asked for in order directing guidance station to this position	Visibility poor due to Fog and light rain

Figure 34
Observer's Report (Lacrosse)

STATE OF READINESS CHART - POSITIONS

	Element	Example
1.	Guidance Position Nr	1
2.	Coordinates	3435645782
3.	Altitude	704
4.	Azimuth DL-RP	3250
5.	Tracker Reading	1278
6.	Section in Position	ABLE
7.	Remarks	(When Necessary)
8.	Firing Position Nr	1
9.	Coordinates	5667755433
10.	Altitude	805
11.	Azimuth OL-RP	2300
12.	Type WH on Missile	HE
13.	Standby Location	1-A
14.	Lchr Nr in Position	1
15.	Remarks	(When Necessary)
16.	Assembly Section Nr	1
	Coordinates	4536742777

Figure 35
State of Readiness Chart (Lacrosse)

STATE OF READINESS CHART - POSITIONS

Guidance Position Nr	Coordinates	Altitude	Azimuth CL - RP	Tracker Reading	Section in Position	Remarks

Firing Position Nr	Coordinates	Altitude	Azimuth CL - RP	Type WH on Missile	Standby Location	Lchr Nr in Position	Remarks

Assembly Sections

Nr _____ Coordinates _____

Nr _____

Form Figure 3a
State of Readiness Chart - Positions (Lacrosse)

STATE OF READINESS CHART-AMMUNITION

Element	Example
MISSILE	
1. Round Nr	225
2. Uncanned	.0645
3. Warm Up	0730
4. Check Out (C/D)	0745
5. Body on Lchr Nr	4
6. Type WH on*	
WARHEAD	
7. Type*	
8. On Hand In Cans*	
9. Ready to Assemble*	
10. On Launchers*	
11. On Trains*	
AMMUNITION TRAIN COMPONENTS	
12. Section	1st
13. Enroute to ASP	0930
14. AT ASP	01000
15. Enroute to Assy Area	01130
16. At Assy Area Nr	Two
17. Load Includes	3 Missiles
18. Remarks	Will Go To Assy Area One

*Omitted for security reasons (available on request)

Figure 36
State of Readiness Chart - Ammunition (Lacrosse)

STATE OF READINESS CHART - AMMUNITION

MISSILE						WARHEAD				
Round Nr	Un-Canned	Warm Up	C/O	Body on Lchr Nr	Type WH On	Type	On Hand In Cans	Ready to Assemble	On Launchers	On Trains

AMMUNITION TRAIN COMPONENTS

Sec	Enroute to ASP	At ASP	Enroute to Assy Area	At Assy Area Nr	Load Includes	Remarks

Form Figure 36a
State of Readiness Chart - Ammunition (Lacrosse)

WARNING ORDER

Element	Example
1. Launcher to follow	NR 2
2. Launcher position	FIRING POINT 1
3. Warhead	HE
4. Fuze	FZ Q
5. Method of fire	NR 2, 1 ROUND
6. Predicted time of fire	0200

Figure 37
Warning Order

ORIENTING DATA

Element	Example
1. Orienting angle	ORIENTING ANGLE 2060
2. Quadrant Elevation	QE 659
3. Azimuth	AZ 4625

Figure 38
Orienting Data

DATA CORRECTION SHEET
(762-mm rocket)

SURVEY DATA (TO 10 M)			MET MESSAGE									
Range	M		Met Station			MDP		Time of Message				Type
Burst (above / below) Launcher	M											
QE_1 (Trial)	mil		Line	Wind Azimuth		Wind Speed		Density			Air Temp	
TF_1 (Trial)	Sec											
Ht of Launcher (to 100 ft)	ft											
Ht of MDP (to 100 ft)	ft											
Launcher (above / below) MDP (to 100 ft)	ft		Dens Temp Corrections									
Lat of Launcher (to 10')	°		Corrected Firing Line									
Az of Wind (to 100 mil)	mil		Corrected Line O									
Az of Fire (to 100 mil)	mil		Surface Pressure P = (0.04005) x (% density) x (temp + 460)					x 0.04005			+ 460	
Chart Direction of Wind	mil							Sur P =				lb/ft²
			Rn Wind = (component) x (velocity)									
Cross Wind = (component) x (velocity) = unit correction x correction												

BALLISTIC FACTORS	Std	Known Values	Unit Variation	Unit Corr QE	+	-	Unit Corr TF	+	-
Prop Temp	77° F		D I						
Proo Wt	lb		D I						
Sur Pressure	2078 lb/ft²		D I						
Density	100%		D I						
Air Temp	59° F		D I						
Empty Wt	lb		D I						
Rn Wind	0 MPH		H R						
Total Corrections to El and TF									
Net Correction to El and TF									

Map Az to Tgt		QE_1 (Trial)		TF_1 (Trial)	
Crosswind Corr		Met Corrections		Met Corrections	
Rot Corr to Az		Rot Corr to El		Rot Corr to TF	
Met Corr Az		QE_2 (Corrected)		TF_2 (Corrected)	

FS FORM 376
3 JAN 57

710-10582 ARMY-FT. SILL, OKLA. 14.5M

Form Figure 28a
Data Correction Sheet

CORRECTED FIRING DATA

Element	Example
1. Corrected deflection	DF 2796
2. Fuze setting	TIME 64.4
3. Corrected QE	QE 666

Figure 39
Corrected Firing Data

FIRE ORDER (CORPORAL).

	Element	Example
1.	Section and position to fire	Section 1, position 1
2.	Missile serial number	Missile number 3642
3.	Radar transmitting frequency*	
4.	Missile transponder local osillator frequency*.	
5.	Missile transponder transmitting frequency*	
6.	Radar local oscillator frequency*	
7.	Radar code*	
8.	Radar pulse repetition frequency*	
9.	Doppler radio beacon*	
10.	Doppler radio code*	
11.	Azimuth guidance termination	Terminate early
12.	Radar transmission termination	Yes
13.	Concentration number	Concentration A26

Figure 40
Fire Order (Corporal)

*Omitted for security reasons (available on request).

Figure 41
Fire Commands

COMPUTER'S FIRE COMMAND RECORD, FA MISSILE BN, CORPORAL

FIRING PLATOON						
PLATOON ADJUST						
Time to fire						
Launcher posn Nr						
Warhead						
Missile Nr						
Trans Rcvr Freq						MC
Transponder oscillator	above		below			
Transponder transmitter freq						MC
Transponder code						
Doppler Beacon Freq						
Doppler Beacon Code						
Maneuver time	OFF	23	30			
Maneuver dir:		dist:				M
C-1 RC (man start) (az cmd term)	0	0				ct
C-2	0	0				ct
Mt-1 (dopp 1) (FT value x 10)	0	0				ct
Mt-2 (dopp 2) (FT value x 10)	0					ct
Fuze settings	Nr					ft
Az of OL						mil
Az of fire						mil
Orienting angle						mil
TF						
Conc Nr						

GUIDANCE PLATOON						
RADAR ADJUST						
Time to fire						
Launcher Nr						
Missile Nr						
Transmitter Freq						MC
[illegible] Xmtr freq						MC
Oscillator	above		below			
PRF						
Code						
Coder dial corr						
2	3	4	5			
Lchr Rn	yds	Az				mil
R_o						yds
R_f						yds
Az of fire	°	'	"			
Radar init az	°	'	"			
Firing Df	°	'	"			
Radar tilt corr (Coriolis)						mil
Init El angle (ACQ Angle)						mil
Delayed tailbreak	21	28				
El Ck Pt:						
t + 30						
t + 40	t + 70					
t + 50	t + 90					
Transmitter off						sec
TF						sec
Conc Nr						

RADIO ADJUST						
Time to Doppler						
Missile Nr						
Xmtr code Ltr						
Code selection Nrs						
Dt - 1 (shutoff on)						sec
Dt - 2 (shutoff off)						sec
Dt - 3 (RC on)						sec
Dt - 4 (RC off)						sec
SO tee setting						cps
RC tee setting						cps
Freq (-10V Δ VD)						cps
Az of fire	°	'	"			
Antenna Df	°					
TF						sec
TSO						sec
TRC						sec
Conc Nr						

COMPUTER ADJUST						
Time to fire						
Missile Nr						
K3						
K4						
K5						
K6						
K7						
K8						
K9						
K10						
K11						
K13						
K18						
K19						
K20						
K21						
SW					L	S
Lchr Rn offset	sw	1	2	3		
K29						
Az ready timer	21		28			
El ready timer	23		30			
RCIT ready timer (Ct-1)						sec
K1						
K2						
K30						
K31						
TF						sec
TSO						sec
TRC						sec
Conc Nr						

FS Form 432
(Gunn) Rev 20 Nov 57

Classify CONFIDENTIAL when filled in

1221 ARMY-FT. SILL, OKLA.

COMPUTER'S WORKSHEET FA MISSILE BN CORPORAL

OFFSETS

1.	Azimuth	M
2.	Range	M

HEIGHT DIFFERENCE

3.	Target Altitude	M
4.	Height of Burst (FT x .3048 = M)	M
5.	Burst Altitude = (3) + (4) =	M
6.	Radar Altitude	M
7.	Height Diff (5) - (6) =	M

DENSITY VARIATION

8.	± ---------- = ± ---------- : ---- (Std Lat) (Radar Lat) (- when Rad Lat is greater	
9.	± (8) --- x .2 = ±	
10.	--------- + ± --------- = ± ---------- (Table G) (9) (Variation)	

RANGE WIND DIRECTION

11.	Met Wind Dir	mil
12.	If necessary	+6400 mil
13.	Total (11) + (12) =	mil
14.	Azimuth of Fire =	mil
15.	Chart wind Dir (13) - (14) =	mil
16.	Rn Wind Component (pg 3 FT) H T	
17.	Rn Wind Corr = H T ---- x ----- = H T -------- (16) (Vel) mph	

FIRING RANGE (Table A)

18.	Range R_s =	M
19.	Burst Ht ---------- x --------- = (5) (Table A) Corr (+ burst above sea level)	M
20.	Radar --------- x --------- = (6) (Table A) Ht Corr (-Rad above sea level)	M
21.	Rotation ---------- x --------- = (Table E) (Table A) Corr (use sign of Corr Factor)	M
22.	Gravity ---------- x --------- = (Table F) (Table A) Corr (use sign of Corr Factor)	M
23.	Density ---------- x --------- = (10) (Table A) Corr (use sign of variation)	M
24.	Rn Wind H T ------- x --------- = (17) (Table A) Corr (+ if head wind)	M
25.	R = (Algebraic Sum (18) thru (24)	M

C-I TIMER SETTING

26.	C - I = -------- x --------- = (7) (Table A)* Corr (- burst above radar)	
27.	C - I Setting (Table B)	
28.	Corrected C - I Setting = (26) + (27) =	

*(IF (7) > 1500M use App A)

< Less > Greater

Classify CONFIDENTIAL when filled in

DOPPLER SETTINGS (Table C, D)

29.	RCTee --------- x ---------- = ----- (Table C) (Freq-KMC) CPS setting	
30.	SO factor (Table C)	
31.	Rad Alt --------- x --------- = (6) (Table D) Corr (- Rad above sea level)	
32.	Density --------- x -------- = (10) (Table D) Corr (use sign of variation)	
33.	Rn wind H T ------ x --------- ± (17) (Table D) Corr (+ if head wind)	
34.	Corr SO factor = (Sum (30) thru (33))	
35.	SOTee -------- x ---------- = ----- setting (34) (Freq-KMC) CPS	
36.	Freq Inc = 160.43 x ---------- = ----- (Freq-KMC) CPS	
37.	Freq - 10v Δ V_D = (35) + (36)	CPS

RADAR TILT CORR ANGLE (Table K)

38.	X1 = L R ------ X2 = ------	
39.	Az factor L R ------	
40.	Az Term --------- x L R ----- = L R ------ (X2) (39)	mil
41.	Radar Tilt L R ------ + L R ----- = L R ------ (X1) (40)	mil

RADAR DEFLECTION

42.	Rad Init Az	° ' "
43.	Az of Fire	° ' "
44.	Diff Angle (+ if (43) left of (42), Diff < 180°) ±	° ' "
45.	B' Location L R --------mil (of center cross hair)	
46.	B' Correction (B' location right, Corr is +) + -	° ' "
47.	Df Shift = (44) + (46) = ± (Take sign of greater value)	° ' "
48.	Rad Referred Df	° ' "
49.	Firing Df = (48) + (47) =	° ' "

ORIENTING ANGLE

50.	Az of Lchr OL	mil
51.	If necessary	+6400 mil
52.	Sum (50) + (51)	mil
53.	Az of Fire (T)	mil
54.	Orient Angle = (52) - (53) =	mil

DOPPLER DEFLECTION

55.	Radio Ref Az	°
56.	Az of Fire	°
57.	Radio Df = (55) - (56) L R	°

((57 is Right when (56) is right of (55))

FS Form 430
(Gunn) Rev 22 Aug 58

1100 ARMY-FT. SILL, OKLA.

Form Figure 41a
Fire Commands

FIRE COMMAND SHEET (REDSTONE)

Element		Example
1. Battery		Alpha
2. Fire mission number		AB 211
3. Firing position		Fox Trot
4. Date and time to fire		061630 Apr
5. Missile number		1002
6. Type warhead*		
7. Trajectory tape number*		
8. Presettings from*		
WS 4	K	
WS 4	X'	
WS 4	Y	
WS 4	Z	
WS 5	E_c	
WS 8	N (M)	
WS 10	T (L)	
WS 12	F_c	
WS 12	F_{ct} .01•	
WS 12	F_c - .01•	
WS 12	V_c (I_c)	
WS 12	J_c (Jc)	
WS 13	H_c / .01•	
	H_c - .01•	
	U_c	

Figure 42
Fire Command Sheet (Redstone)

*Omitted due to classification (available on request)

WARNING ORDER (LACROSSE)

Element	Example
1. Warning	Fire Mission
2. Launcher to Fire	Launcher Nr 1
3. Firing Position	Firing Position 3
4. GS to Control	GS Nr 4
5. Warhead*	
6. Time to Fire	At my command (an estimated time may be given here, i.e., 0515)
7. Concentration	EF 105

*Omitted for security reasons (available on request).

Figure 43
Warning Order (Lacrosse)

SECOND PHASE ORDER (LACROSSE)

Element	Example
1. Direction in which to lay the missile (Firing Chart)	Orienting Angle 2152 Mils
2. Altimeter setting (Firing Tables)*	
3. Dive Angle (FDO order)*	
4. Beacon Antenna (Firing Chart)*	
5. Rail Elevation (Firing Tables)	Elevation 1067

*Omitted for security reasons (available on request).

Figure 44
Second Phase Order (Lacrosse)

GUIDANCE SETTINGS (LACROSSE)

	Element	Example
1.	Tracker setting to target from GS* (Computers)	
2.	Slant Range to Target From GS (Computers)*	
3.	Vertical Angle, GS to Target (Computers)*	
4.	Stator Setting (Firing Chart)*	
5.	Turn Angle (FDO order)*	
6.	Dive Angle (FDO order)*	
7.	Tracker Setting to Acquisition Point * (Firing Chart)	
8.	Range to Acquisition Point (Firing Chart)*	
9.	Vertical Angle, GS to Acquisition* Point (Computed by Mil Relation)	
10.	Warhead (FDO order)*	
11.	Approximate Time to Fire	0940

*Omitted for security reasons (available on request).

Figure 45
Guidance Settings (Lacrosse)

INPUTS TO Mortar Battery FDC (Inf Div)

	ELECTRICAL (telephone, teletype, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
FROM:				
OBSERVERS				
Fire requests	15	2100		
Subsequent Fire	75	1075		
SUPPORTING ARTILLERY HEADQUARTERS				
Data for replot	5	485		
Fire capabilities	4	384		
Metro messages	12	1080		
Survey data	1	300		
SUMMARY.	112	6224		

NOTE: Organic to the Infantry Division Battle Group. Flow of fire control information will be through Artillery channels.

INPUTS TO 105 Howitzer Battery FDC (Inf Div) (Towed)

	ELECTRICAL (telephone, teletype, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
FROM:				
OBSERVERS				
Fire requests	15	2100		
Subsequent fire requests	75	1875		
BATTALION HEADQUARTERS				
Battery data sheet	1	420	1	420
Fire commands	2	220		
Fire for effect data	5	355		
Fire orders	10	1200		
Metro messages	12	1380		
Replot data	15	1200		
Survey data	1	227		
Time on target	2	304		
SUMMARY	138	9281	1	420

INPUTS TO 105 Howitzer Battalion FDC (Inf Div) (Towed)

	ELECTRICAL (telephone, teletype, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
FROM:				
OBSERVERS				
Fire requests	30	4200		
Subsequent fire requests	150	6000		
FIVE BATTERIES				
Data for replot	15	1200		
Executive officer reports	10	5500		
Fire for effect coordinates and altitude when applicable	15	1065		
Reports of targets fired on	30	3030		
DIVISION ARTILLERY				
Fire missions	4	896	1	2350
Metro messages	12	1380		
Target list	1	2350		
Time on target	1	144		
SUMMARY	268	25765	1	2350

INPUTS TO 155mm How Battery FDC (Composite Bn Inf Div) (Towed)

	ELECTRICAL (telephone, teletype, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
FROM:				
OBSERVERS				
Fire requests	5	700		
Subsequent fire requests	25	625		
BATTALION HEADQUARTERS				
Battery data sheet	1	420	1	420
Fire commands	5	550		
Fire for effect data	7	497		
Fire orders	10	1200		
Metro messages	12	1380		
Replot data	7	679		
Survey data	1	227		
Time on target	4	608		
SUMMARY	77	6886	1	420

INPUTS TO 8 inch Battery FDC
(Composite Bn) Inf Div
(Towed)

	ELECTRICAL (telephone, teletype, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
FROM:				
OBSERVERS				
Fire request	5	700		
Subsequent fire requests	25	625		
BATTALION FDC				
Atomic fire order	2	300		
Battery data sheet	1	420	1	420
Fire commands	5	550		
Fire for effect data	7	497		
Fire orders	10	1200		
Metro messages	12	1380		
Replot data	7	679		
Survey data	1	227		
Time on target	4	608		
SUMMARY	79	7186	1	420

INPUTS TO 762 Rocket Battery FDC
(Composite Battalion Only)
(Inf Div) (S.P.)

	ELECTRICAL (telephone, teletype, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
FROM:				
ORGANIC SUBORDINATE UNITS				
Launching Platoon Commanders report	10	2500		
Low level wind correction report	5	400		
Survey Section report	10	950		
COMPOSITE BATTALION HEADQUARTERS				
Fire mission	6	660		
Fire order	6	540		
Metro messages	12	1360		
SUMMARY	49	6530		

INPUTS TO Composite Battalion FDC
(Inf Div) (Towed)

FROM:	ELECTRICAL (telephone, teletype, radio) Items Per day	ELECTRICAL (telephone, teletype, radio) Characters Per day	HARD COPY Items Per day	HARD COPY Characters Per day
OBSERVERS				
Fire requests	2	260		
Subsequent fire request	10	250		
THREE HOWITZER BATTERIES				
Data for replot	10	370		
Executive officer report	6	3300		
Fire for effect coordinates and altitude when applicable	10	710		
Reports of targets	15	1600		
762mm ROCKET BATTERY				
Launcher Platoon Commander's report	10	2600		
Low Level Wind correction report	10	800		
Survey section reports	10	900		
DIVISION ARTILLERY				
Atomic Fire order	6	1200		
Atomic fire request	11	1870		
Fire missions	6	660		
Metro messages	12	1380		
Target list	1	2350	1	2350
Time on target	1	144		
SUMMARY	120	19,214	1	2350

INPUTS TO Division Artillery FDC (Inf Div)
(Towed)

	ELECTRICAL (telephone, teletype, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
FROM:				
SUBORDINATE UNITS				
Air observers fire request	2	220		
Fire Capabilities	4	440		
Fire for effect data	10	760		
Request for additional fire	6	1740		
HIGHER ARTILLERY HEADQUARTERS				
Atomic fire order	3	1200		
Atomic fire request	12	2100		
Fire missions	1	140		
Metro messages	12	1380		
Target list	1	2350	1	2350
Time on targets	1	150		
SUMMARY	55	10,500	1	2350

INPUTS TO Division Artillery FDC (Armd Div)
(S.P.)

	ELECTRICAL (telephone, teletype, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
FROM:				
SUBORINATE UNITS				
Air observers fire request	6	660		
Fire capabilities	8	880		
Request for additional fire	12	3480		
HIGHER ARTILLERY HEADQUARTERS				
Atomic fire order	6	1200		
Atomic fire request	12	2100		
Fire missions	1	140		
Metro messages	12	1380		
Target list	1	2350	1	2350
Time on targets	1	150		
SUMMARY	59	12,340	1	2350

INPUTS TO Artillery Group Howitzer or Gun Battery

	ELECTRICAL (telephone, teletype, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
FROM:				
BATTALION FDC				
Battery data sheet	1	420	1	420
Fire commands	6	1080		
Fire for effect data	3	213		
Fire orders	10	1500		
Metro messages	12	1380		
Replot data	16	1572		
Survey data	1	227		
Time on targets	1	152		
SUMMARY	50	6544	1	420

INPUTS TO Artillery Group Howitzer or Gun Battalion

	ELECTRICAL (telephone, teletype, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
FROM:				
THREE BATTERIES				
Data for replot	10	970		
Executive officer reports	3	1650		
Report of all targets fired on	20	2520		
Fire for effect coordinates and altitude when applicable	9	639		
HIGHER ARTILLERY HEADQUARTERS				
Atomic fire order	2	500		
Fire missions	20	4480		
Metro messages	12	1380		
Target lists	1	2350	1	2350
Time on target	6	912		
SUMMARY	83	15401	1	2350

INPUTS TO Artillery Group FDC

	ELECTRICAL (telephone, teletype, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
FROM:				
SUBORDINATE UNITS				
Fire capabilities	6	1320		
Fire for effect data	6	852		
Request for additional fire	8	2320		
HIGHER ARTILLERY HEADQUARTERS				
Air observer's fire request	10	1100		
Atomic fire order	22	4400		
Atomic fire request	12	2100		
Fire missions	30	4200		
Metro messages	12	1380		
Target list	1	2350	1	2350
Time on targets	1	150		
SUMMARY	108	20172	1	2350

INPUTS TO 762mm Rkt Battalion FDC

	ELECTRICAL (telephone, teletype, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
FROM:				
SUBORDINATE UNITS				
Launching plt cmdr's report	20	5200		
Low level wind correction report	10	800		
Survey section report	10	950		
CORPS ARTY FDC				
Fire missions	10	1100		
Fire orders	12	1080		
Metro messages	12	1380		
Target list	1	2350	1	2350
SUMMARY	75	12860	1	2350

INPUTS TO Corporal Battalion FDC

	ELECTRICAL (telephone, teletype, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
FROM:				
HEADQUARTERS AND SERVICE BATTERY				
Ammunition record	12	7020		
Basic survey data	12	8820		
CORPS ARTY FDC				
Fire missions	6	1560		
Met-o messages	12	840		
SUMMARY	42	18240		

INPUTS TO Corps Artillery FDC

	ELECTRICAL (telephone, teletype, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
FROM:				
GROUP ARTILLERY FDC				
Atomic fire requests	11	1925		
Fire capabilities	5	550		
Requests for additional fire	12	3480		
DIVISION ARTILLERY FDC				
Atomic fire request	44	7700		
Fire capabilities	16	1760		
Request for additional fire	20	5820		
ATTACHED SUBORDINATE UNITS				
Ammunition record	12	7020		
Corrected firing data	12	780		
Metro messages	12	1380		
Survey data	12	8820		
HIGHER HEADQUARTERS				
Atomic fire order	12	2400		
Atomic fire request	22	3850		
Fire missions	12	1320		
Target list	1	2350	1	2350
SUMMARY	203	49155	1	2350

INPUTS TO 280 Gun Battery FDC

	ELECTRICAL (telephone, teletype, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
FROM:				
BATTALION FDC				
Battery data sheet	1	420	1	420
Fire commands	6	1080		
Fire for effect data	9	639		
Fire orders	10	1500		
Metro messages	12	1380		
Replot data	15	1200		
Survey data	1	227		
Time on target	3	153		
SUMMARY		5599	1	420

INPUTS TO 280 Gun FDC Battalion FDC

	ELECTRICAL (telephone, teletype, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
FROM:				
BATTERIES				
Data for replot	10	970		
Executive officer reports	3	1650		
Fire for effect coordinates and altitude when applicable	9	639		
Report of all targets fired on	20	2520		
ARMY ARTILLERY SECTION				
Atomic fire order	6	1200		
Atomic fire request	12	2100		
Fire missions	20	4480		
Metro messages	12	1380		
Target list	1	2350	1	2350
SUMMARY	93	17,89	1	2350

INPUTS TO Redstone Group FDC

	ELECTRICAL (telephone, teletype, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
FROM:				
SUBORDINATE UNITS				
Status data	4	380	4	380
Status and readiness chart	6	3950	6	3950
Survey data	6	960	6	960
ARMY ARTILLERY SECTION				
Fire missions	4	960		
Target list	1	2350	1	2350
SUMMARY	21	8600	17	7640

INPUTS TO Army Artillery Section

	ELECTRICAL (telephone, teletype, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
FROM:				
SUBORDINATE UNITS				
Fire capabilities	1	96		
Request for additional fire	1	290		
Request for atomic fire	10	1750		
Status data	4	380	4	380
Status and readiness chart	6	3950	6	3950
Survey data	6	960	6	690
Target list	1	2350		
HIGHER HEADQUARTERS				
Atomic fire request	12	2100		
Target list	1	2350	1	2350
SUMMARY	42	14226	17	7370

OUTPUTS FROM 4.2'' Mortar Battery FDC (Inf Div)

	ELECTRICAL (telephone, teletype, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
TO:				
OBSERVERS				
Fire orders	30	3600		
SUPPORTING ARTILLERY FDC				
Data for replot	5	500		
Fire for effect data	5	400		
Fire missions	15	2100		
Report of targets fired on	10	1250		
Request for additional fire	10	2800		
SUMMARY	75	10650		

OUTPUTS FROM 105 How Battery FDC (Inf Div)

TO:	ELECTRICAL (elephone, teletype, radio) Items Per day	Characters Per day	HARD COPY Items Per day	Characters Per day
OBSERVERS				
Fire orders	15	1800		
BATTALION FDC				
Data for replot	15	1200		
Executive's report	2	1100		
Fire for effect data	5	400		
Report of targets fired on	10	1250		
SUMMARY	47	5750		

OUTPUTS FROM 105mm How Battalion FDC
(Towed) (Inf Div)

	ELECTRICAL (telephone, teletype, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
TO:				
BATTERY FDC				
Battery data sheet	5	2100		
Fire commands	10	1080		
Fire for effect data	25	1775		
Fire order	30	3600		
Metro messages	12	1380		
Replot data	15	2425		
Survey data	15	1135		
Time on target	10	1520		
DIVISION FDC				
Fire capabilities	2	220		
Fire for effect data	5	390		
Request for additional fire	3	870		
SUMMARY	132	16495		

OUTPUTS FROM 155mm Mow Battery FDC (Inf Div)
(Composite Battalion) (Towed)

	ELECTRICAL (telephone, teletype, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
TO:				
BATTALION FDC				
Data for replot	4	388		
Executive's report	2	1100		
Fire for effect data	4	284		
Report of targets fired on	5	600		
SUMMARY	15	2372		

OUTPUTS FROM 8 inch How Battery FDC (Inf Div)
(Composite Battalion)

	ELECTRICAL (telephone, teletype, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
TO:				
BATTALION FDC				
Data for replot	2	194		
Executives report	2	1100		
Fire for effect data	2	142		
Report of targets fired on	5	600		
SUMMARY	11	2036		

OUTPUTS FROM 762mm Rocket (SP) Battery FDC
(Composite Battalion) (Inf Div)

	ELECTRICAL (telephone, teletype, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
TO:				
LAUNCHER PLATOON				
Corrected firing data	6	395		
Fire order	12	1080		
Orienting data	6	324		
Warning order	6	600		
COMPOSITE BATTALION FDC				
Launching platoon commander's report	10	2600		
Survey section report	10	900		
Low level wing correction report	10	800		
SUMMARY	60	6699		

OUTPUTS FROM Composite Battalion FDC (Inf Div)

	ELECTRICAL (telephone, teletype, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
TO:				
BATTERY FDC (155mm and 8" HOW)				
Atomic fire order	2	300		
Fire commands	15	1650		
Fire for effect data	21	1491		
Fire order	30	3600		
Metro messages	12	1380		
Replot data	21	2037		
Survey data	3	671		
Time on target	12	1824		
762mm ROCKET BATTERY				
Fire missions	6	660		
Fire order	6	540		
Metro messages	12	1380		
DIVISION FDC				
Fire capabilities	2	220		
Fire for effect data	5	390		
Request for additional fire	3	870		
SUMMARY	150	17013		

OUTPUTS FROM Division Artillery FDC (Inf Div)

	ELECTRICAL (telephone, teletype, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
TO:				
SUBORDINATE UNITS				
Atomic fire order	6	1200		
Atomic fire request	11	1870		
Fire missions	10	1556		
Metro messages	12	1380		
Target list	1	2350	1	2350
Time on target	1	144		
CORP ARTILLERY FDC				
Atomic fire request	11	1925		
Fire capabilities	4	440		
Request for additional fire	5	1455		
SUMMARY	61	12320	1	2350

OUTPUTS FROM Division Artillery FDC (Armd Div)

	ELECTRICAL (telephone, teletype, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
TO:				
SUBORDINATE UNITS				
Atomic fire order	6	1200		
Metro messages	12	1380		
Fire missions	10	1556		
Atomic fire request	11	1870		
Target list	1	2350	1	2350
Time on target	1	144		
CORP ARTILLERY FDC				
Atomic fire request	11	1925		
Fire capabilities	4	440		
Request for additional fire	5	1455		
SUMMARY	61	12320	1	2350

OUTPUTS FROM Artillery Group HQ or Gun Battery

	ELECTRICAL (telephone, tele type, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
TO:				
BATTALION FDC				
Data for meulot	3	301		
Executive's report	1	550		
Fire for effect data	3	213		
Report on targets fired on	7	840		
SUMMARY	14	1904		

OUTPUTS FROM Artillery Group How or Gun Battalion

	ELECTRICAL (telephone, teletype, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
TO:				
THREE BATTERIES				
Battery data sheets	3	1260	3	1260
Fire commands	3	360		
Fire for effect data	9	639		
Fire order	30	4500		
Metro messages	12	1380		
Replot data	16	1572		
Survey data	3	671		
Time on target	3	456		
CORP ARTILLERY OR ARTILLERY GROUP FDC				
Fire capabilities	1	220		
Fire for effect data	1	142		
Request for add tional fire	2	564		
SUMMARY	83	11764	3	1260

OUTPUTS FROM Artillery Group FDC

	ELECTRIC L (telephone, tele ype, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
TO:				
SUBORDINATE UNITS				
Atomic fire order	10	2000		
Fire missions	80	17920		
Metro messages	12	1380		
Target list	1	2350	1	[illegible]
Time on target	6	912		
HIGHER ARTILLERY HEADQUARTERS				
Atomic fire request	3	422		
Fire capabilities	1	110		
Request for additional fire	6	1740		
SUMMARY	119	26834		2350

OUTPUTS [illegible] battalion (HJ)

	(teleprinter, telephone, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
TO:				
LAUNCHING PLATOON				
Corrected firing data	[illegible]	[illegible]		
Fire order	[illegible]	[illegible]		
Orienting data	[illegible]	[illegible]		
Warning order	12	1 30		
CORP ARTILLERY FDC				
Corrected firing data	[illegible]	780		
SUMMARY	[illegible]	4380		

OUTPUTS FROM Corporal Battalion FDC

	ELECTRICAL (telephone, teletype, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
TO:				
BATTERIES				
FDO fire order	6	1890		
Fire commands	6	11700		
CORP ARTILLERY FDC				
Ammunition record	12	7020		
Survey data	12	8820		
SUMMARY	36	29430		

OUTPUTS FROM Corps Artillery FDC

	ELECTRICAL (telephone, teletype, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
TO:				
COORDINATE UNITS				
Atomic fire order	22	4400		
Fire missions	31	4340		
Metro messages	12	1380		
Target list	1	2350	1	2350
Time on target	1	150		
ARMY ARTILLERY SECTION				
Request for Atomic fire	10	1750		
Request for additional fire	1	290		
Target list	1	2350	1	2350
SUMMARY	79	17010	2	4700

OUTPUTS FROM 280mm Gun Battery FDC

	ELECTRICAL (telephone, teletype, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
TO:				
BATTALION FDC				
Data for replot	3	323		
Executive's report	1	550		
Fire for effect data	3	213		
Report of targets fired on	7	840		
SUMMARY	14	1926		

OUTPUTS FROM 280mm Gun Battalion FDC

	ELECTRICAL (telephone, teletype, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
TO:				
THREE BATTERIES				
Battery data sheets	3	1260	3	1260
Fire commands	18	3240		
Fire for effect data	9	639		
Fire orders	30	4500		
Metro messages	36	4140		
Replot data	15	1200		
Survey data	3	681		
Time on target	3	153		
ARMY ARTILLERY SECTION				
Fire capabilities	1	96		
Request for additional fire	1	290		
Survey data	6	960		
SUMMARY	125	17159	3	1260

OUTPUTS FROM Redstone Group FDC

	ELECTRICAL (telephone, teletype, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
TO:				
MISSILE				
Fire command sheet	4	1560		
ARMY ARTILLERY SECTION				
Status data	4	380	4	380
Status and readiness chart	6	3950	6	3950
Survey data	6	960	6	960
SUMMARY	20	6850	16	5290

OUTPUTS FROM Army Artillery Section

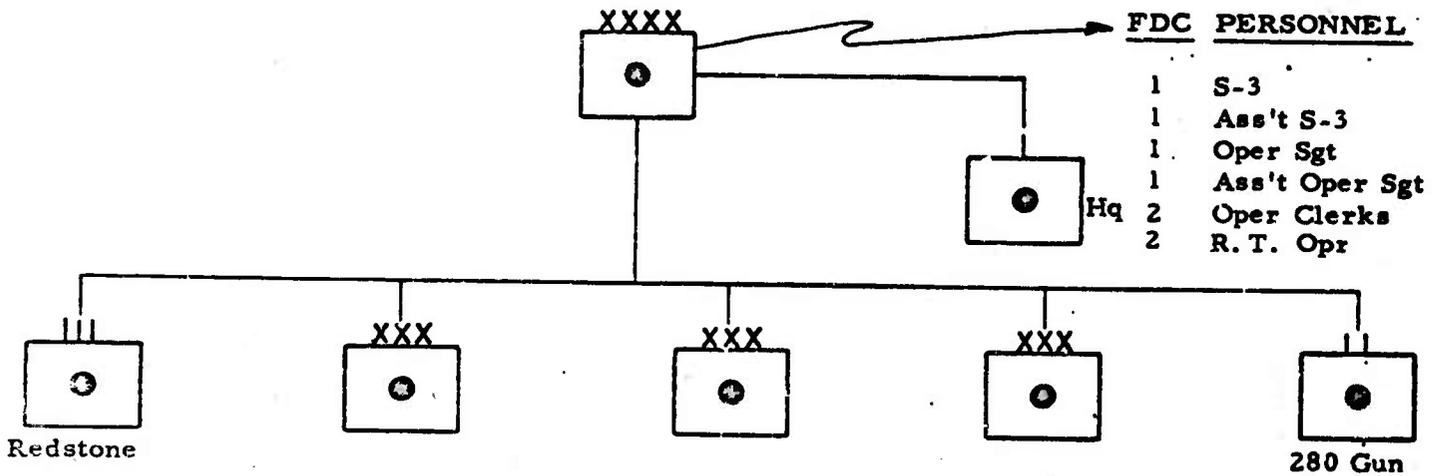
	ELECTRICAL (telephone, teletype, radio)		HARD COPY	
	Items Per day	Characters Per day	Items Per day	Characters Per day
TO:				
SUBORDINATE UNITS				
Atomic fire order	12	2400		
Fire mission	24	5440		
Target list	1	2350	1	2350
HIGHER ARTILLERY HEADQUARTERS				
Target list	1	2350	1	2350
SUMMARY	38	12540	2	4700

APPENDIX B TO ANNEX 3

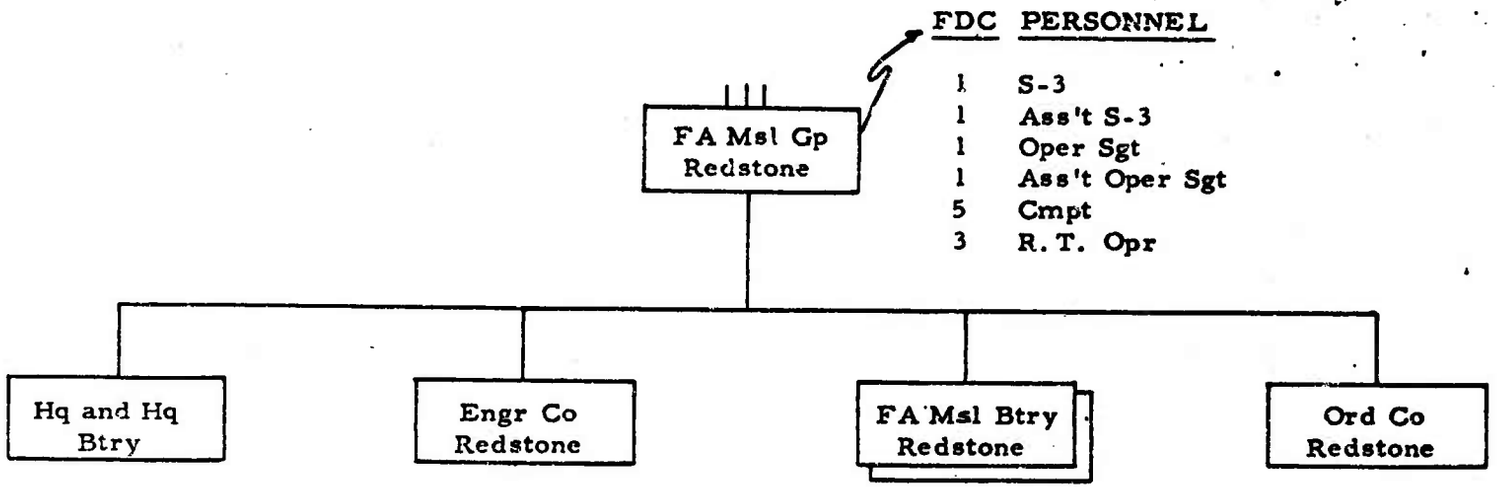
ORGANIZATION DEFINITION

1. In the following organizational charts all present field artillery headquarters and units are defined graphically. It should be remembered that many new organizational concepts are being studied. As an example, there is a strong possibility the Infantry Division Artillery will be changed to provide additional artillery direct support for the Infantry Battle Groups. The Lacrosse, Sergeant, and Pershing organizations are not included as their TO&E's are not officially approved at this time.

2. Artillery at all levels is organized to provide 24-hour operation. The FDC personnel shown may not all be present at any one time but are available when operations necessitate. It should also be mentioned that in many cases, providing this 24-hour operational capability, dictates the use of other personnel within the organization, especially communication personnel.



TYPE FIELD ARMY ARTILLERY
HQ AND HQ BTRY ARMY ARTILLERY TOE 6-601



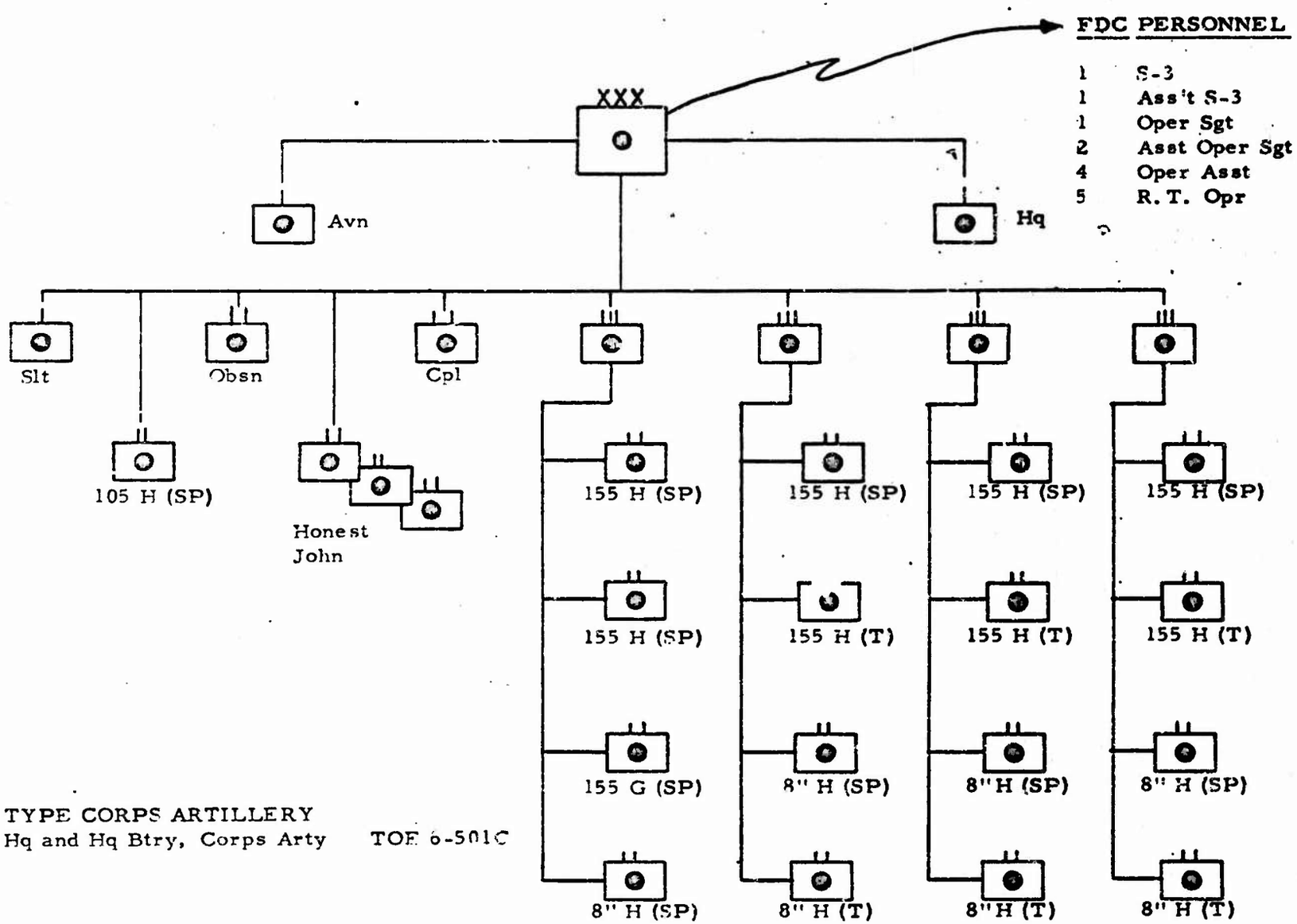
FA MSL GROUP, REDSTONE TOE 6-630T
HQ and HQ BTRY, FA MSL GROUP, REDSTONE TOE 6-631T

FA BATTALION 280 mm GUN TOE 6-535C
HQ and HQ BTRY, FA BN 280 mm GUN TOE 6-536C

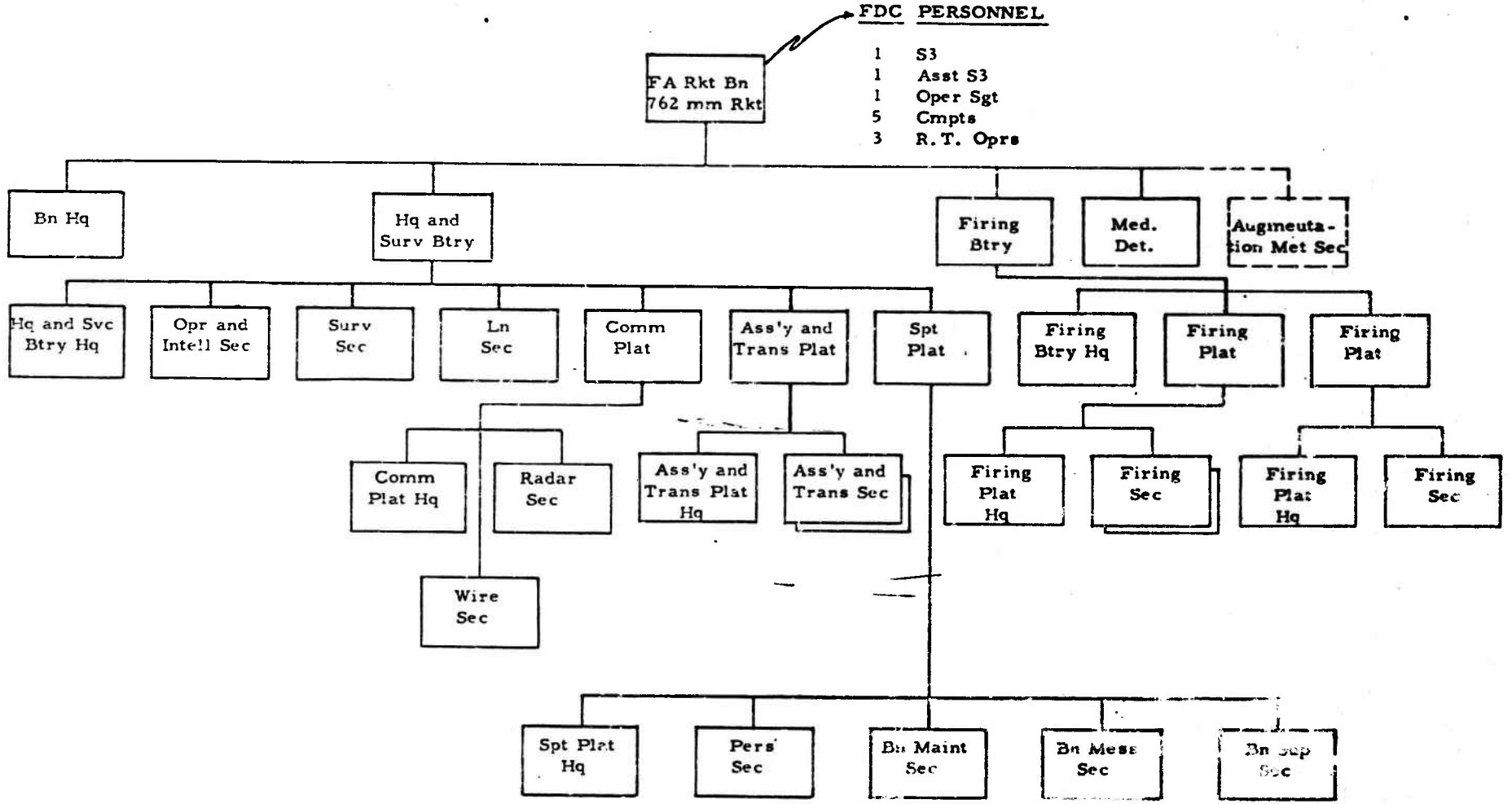
Appendix B to Annex 3

FA BATTERY, 280 mm GUN TOE 6-537C

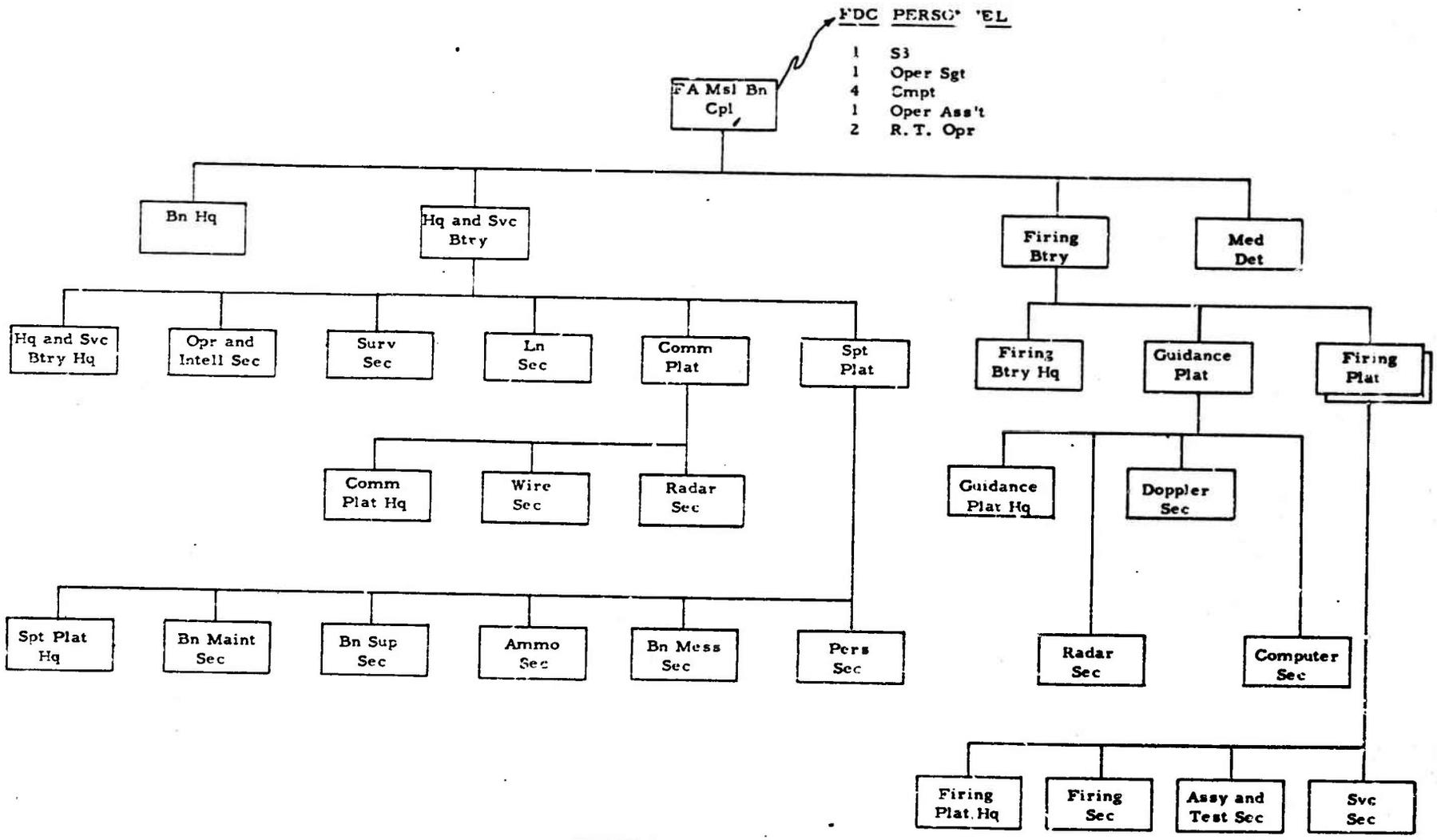
Appendix B to Annex 3



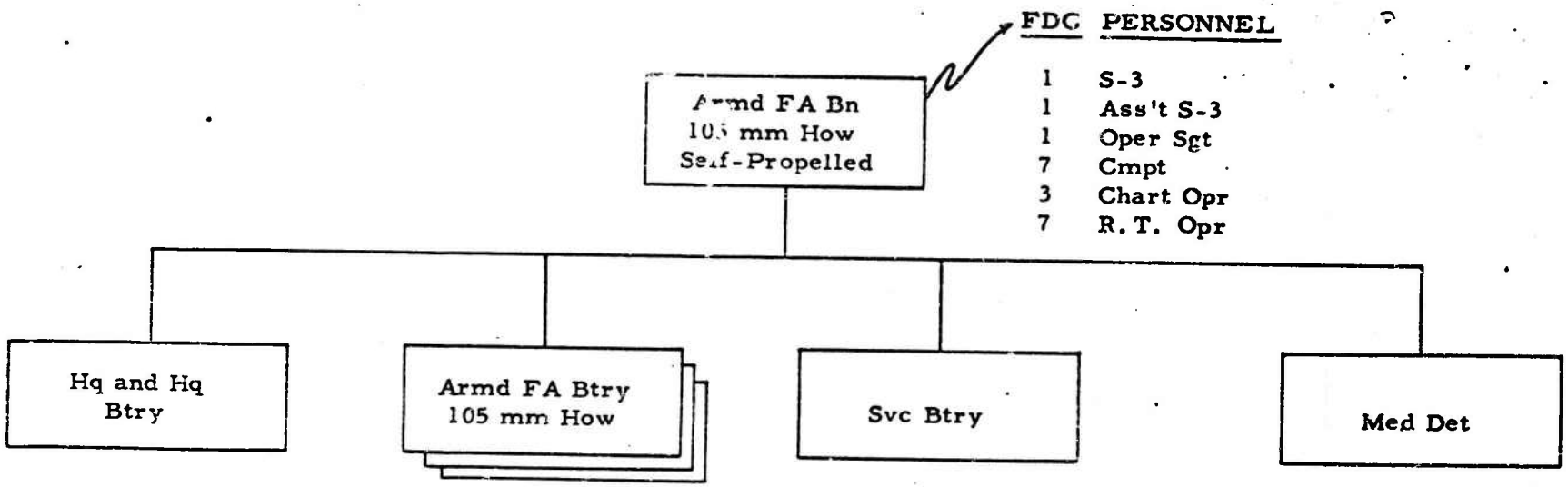
TYPE CORPS ARTILLERY
Hq and Hq Btry, Corps Arty TOE 6-501C



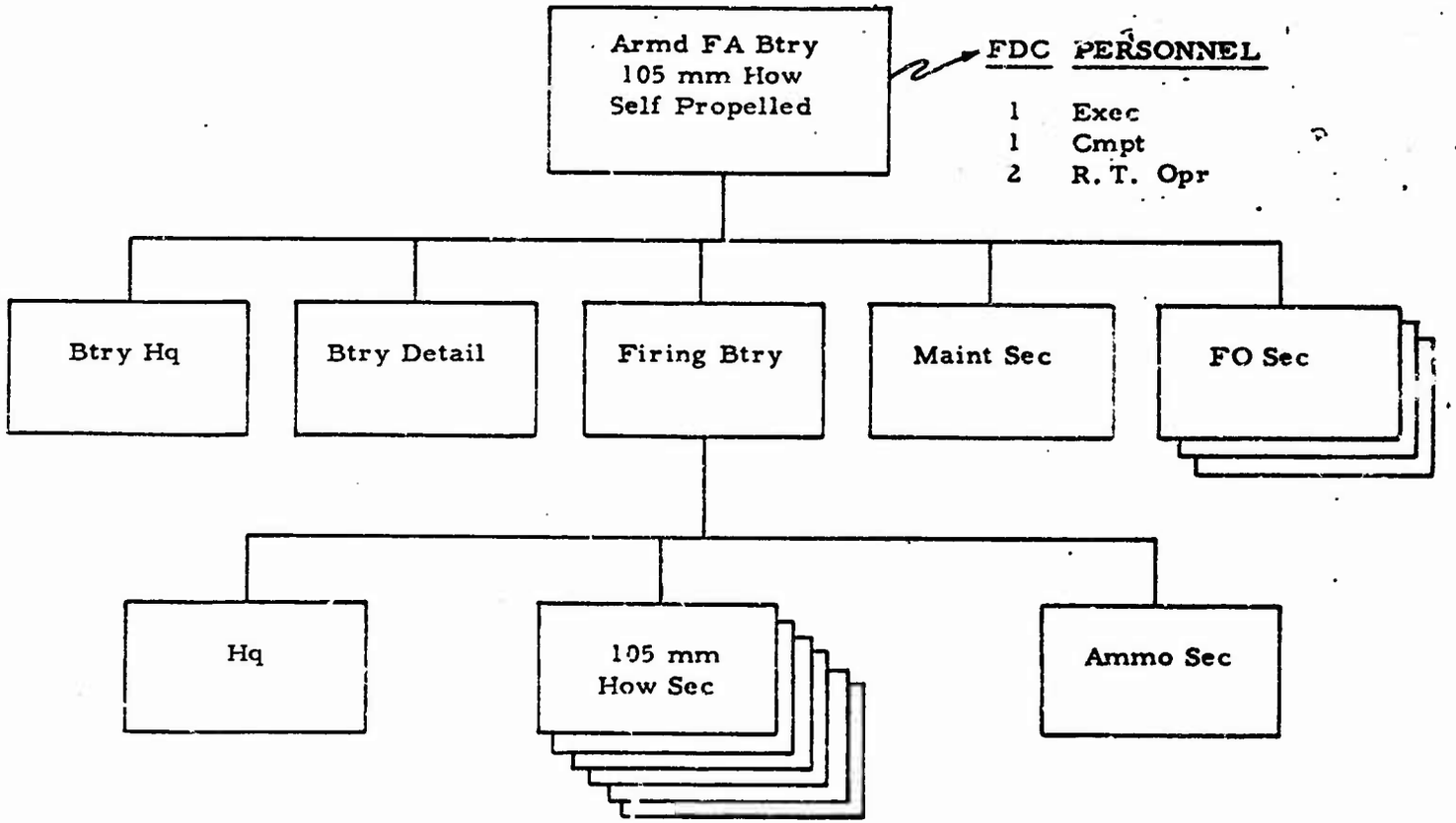
FA RKT BN, 762 mm RKT - TOE 6-525C



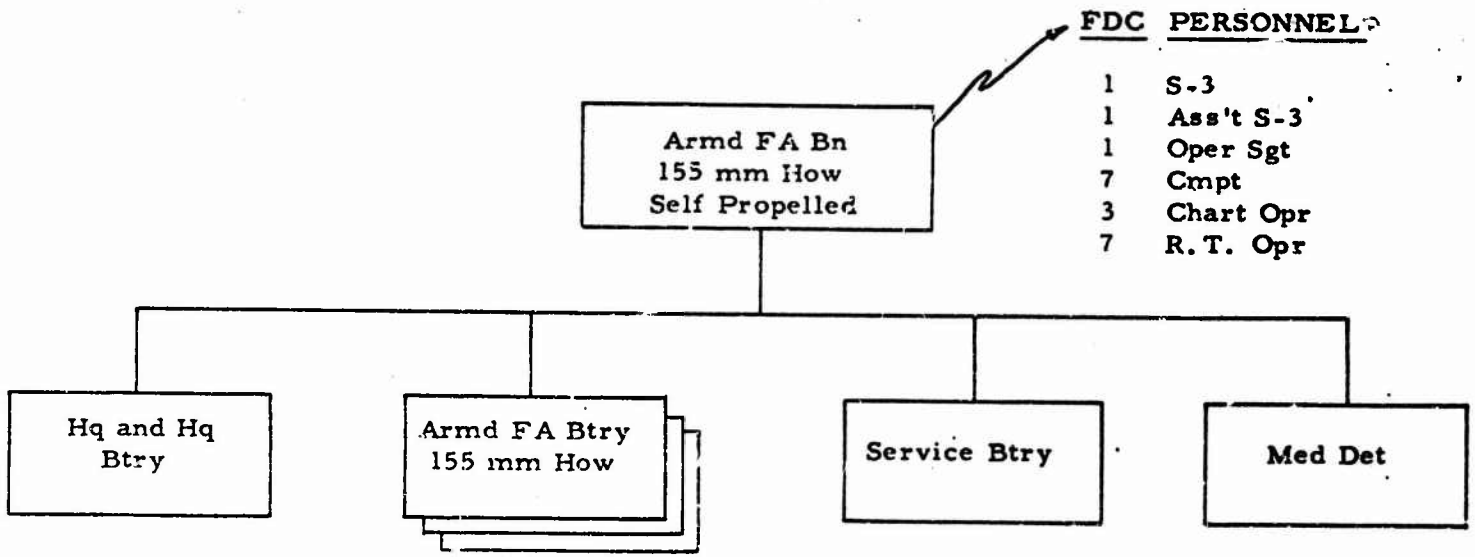
FA MSL BN, CPL TOE 6-545D



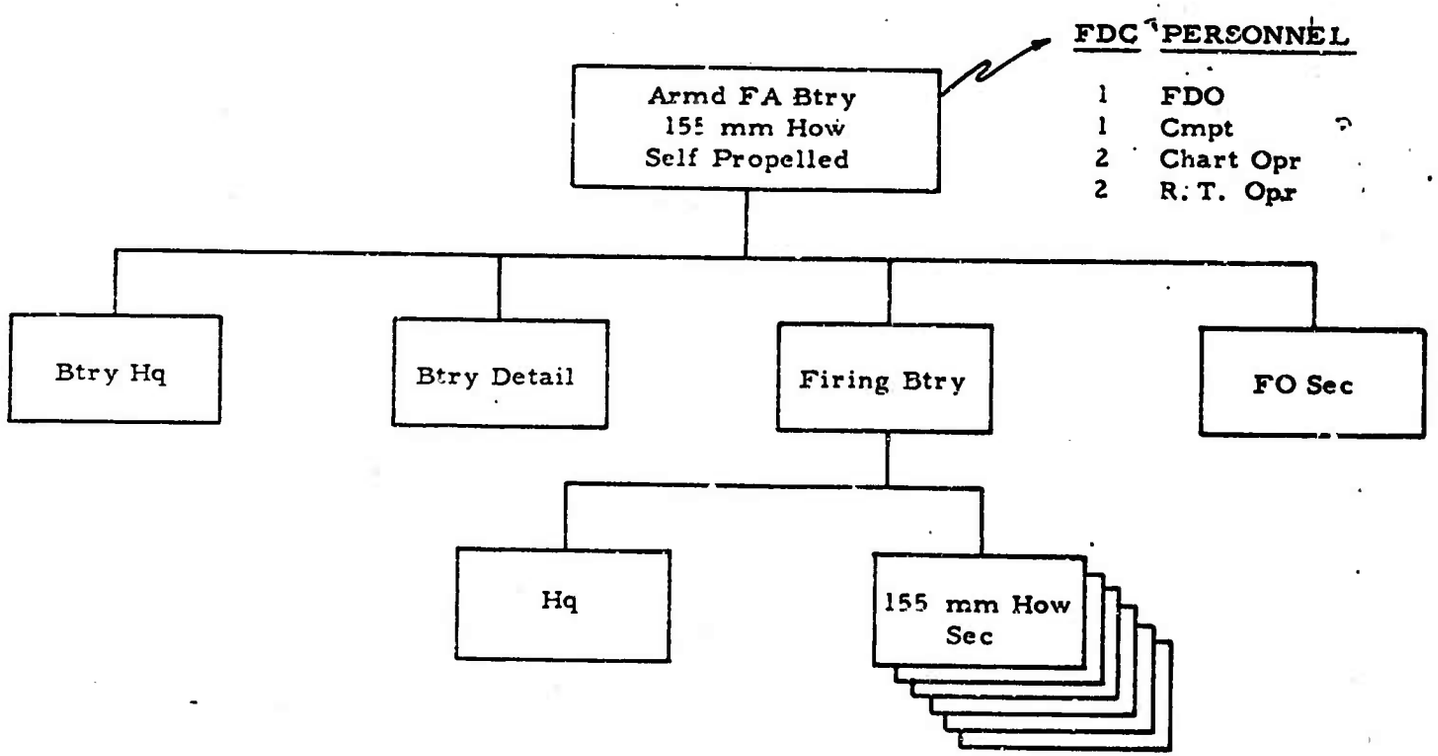
ARMD FA BATTALION 105 mm HOW SP TOE 6-315C
HQ AND HQ BTRY, ARMD FA BATTALION 105 mm HOW SP TOE 6-316C



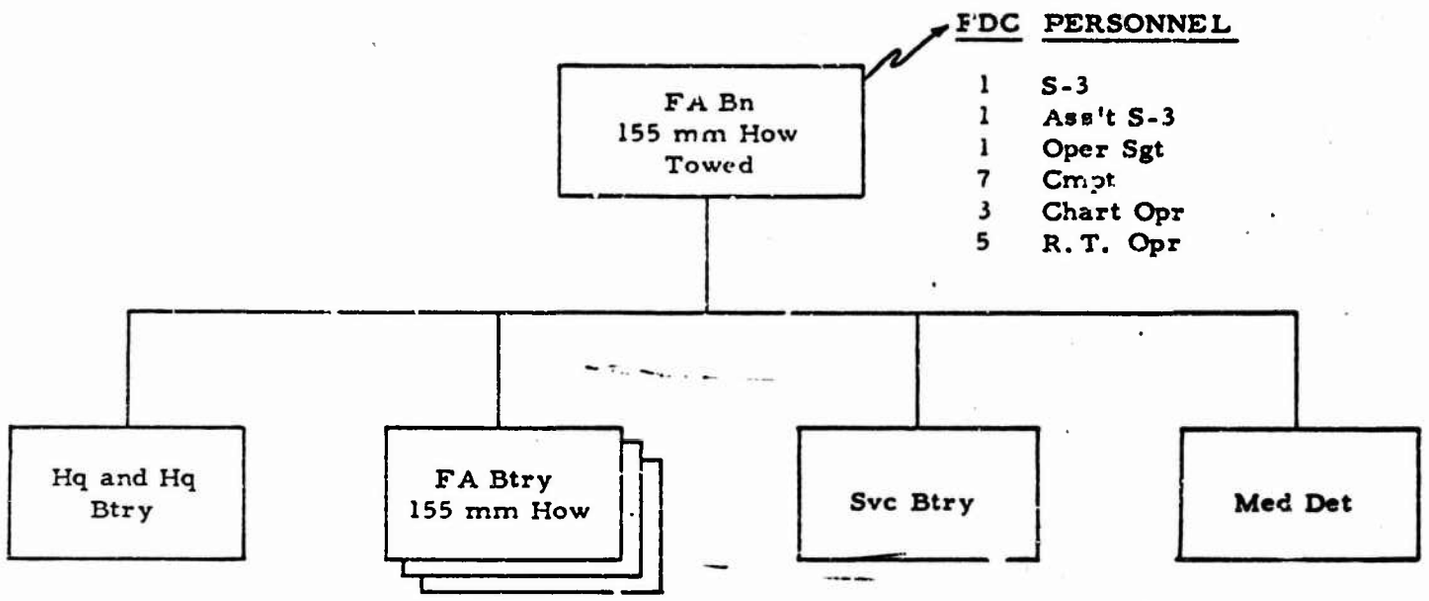
ARMD FA BTRY 105 mm HOW, SP TOE 6-317T



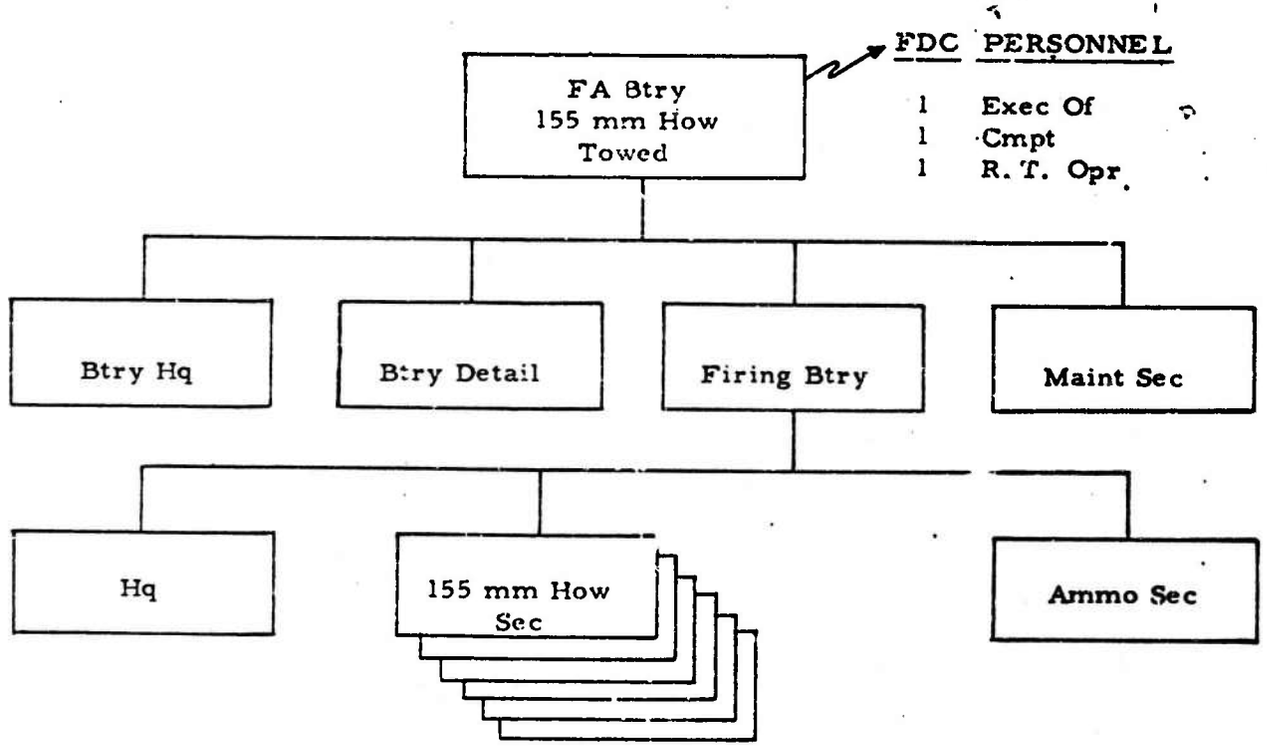
ARMD FA BATTALION, 155 mm HOW, SP TOE 6-325C
HQ and HQ BATTERY, ARMD FA BATTALION 155 mm HOW, SP TOE 6-326C



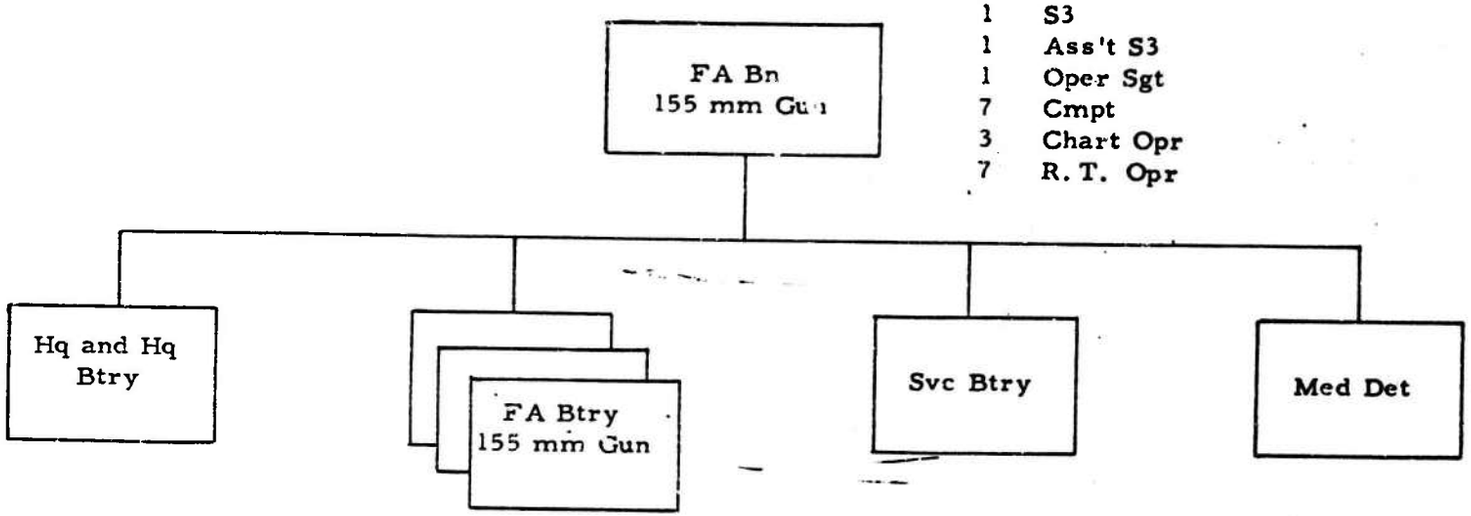
ARMD FA BTRY, 155 mm HOW, (SP) TOE 6-327T



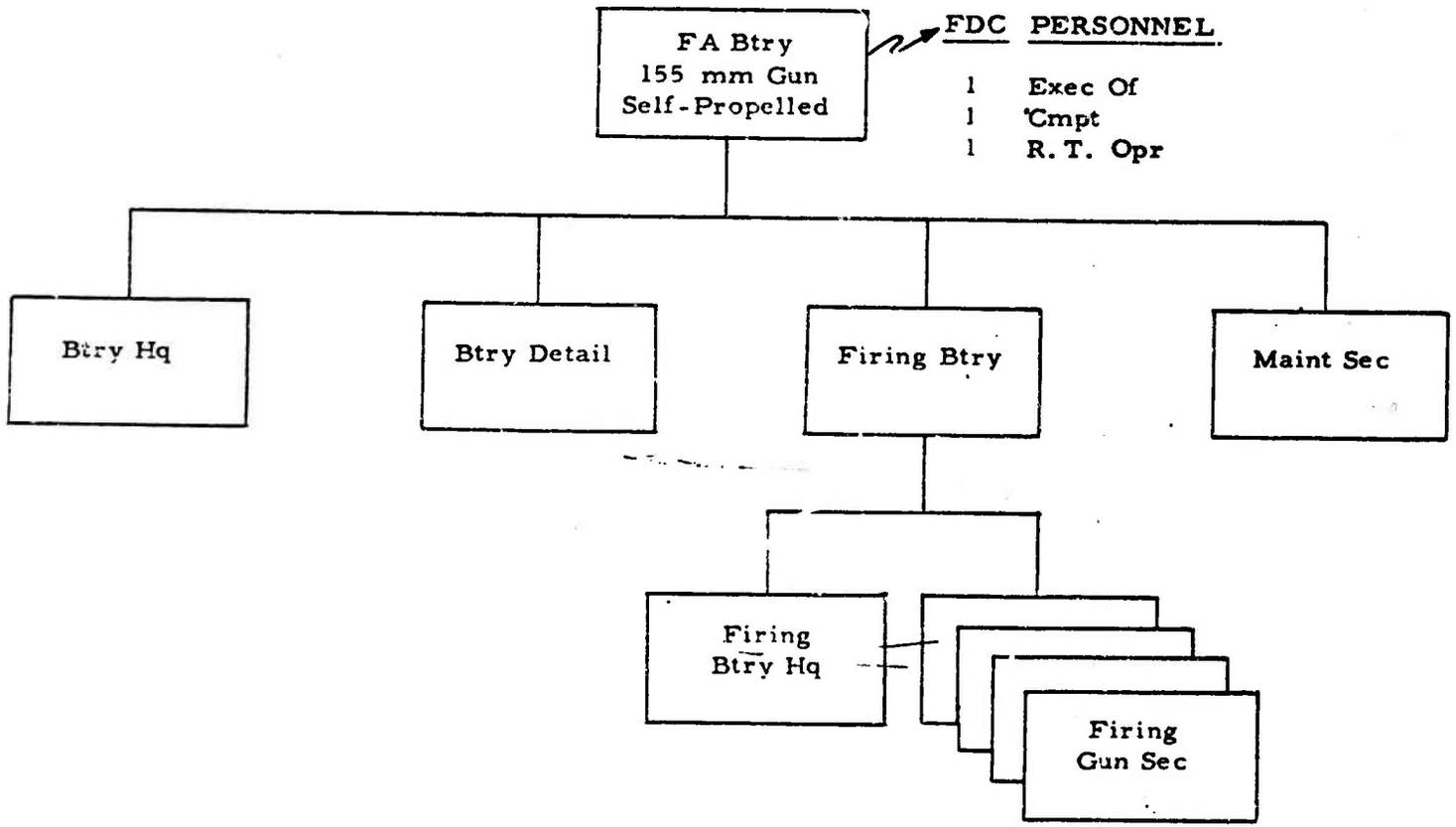
FA BATTALION, 155 mm HOW (TOWED) TOE 6-135C
HQ and HQ BTRY, FA BN, 155 mm HOW TOE 6-136C



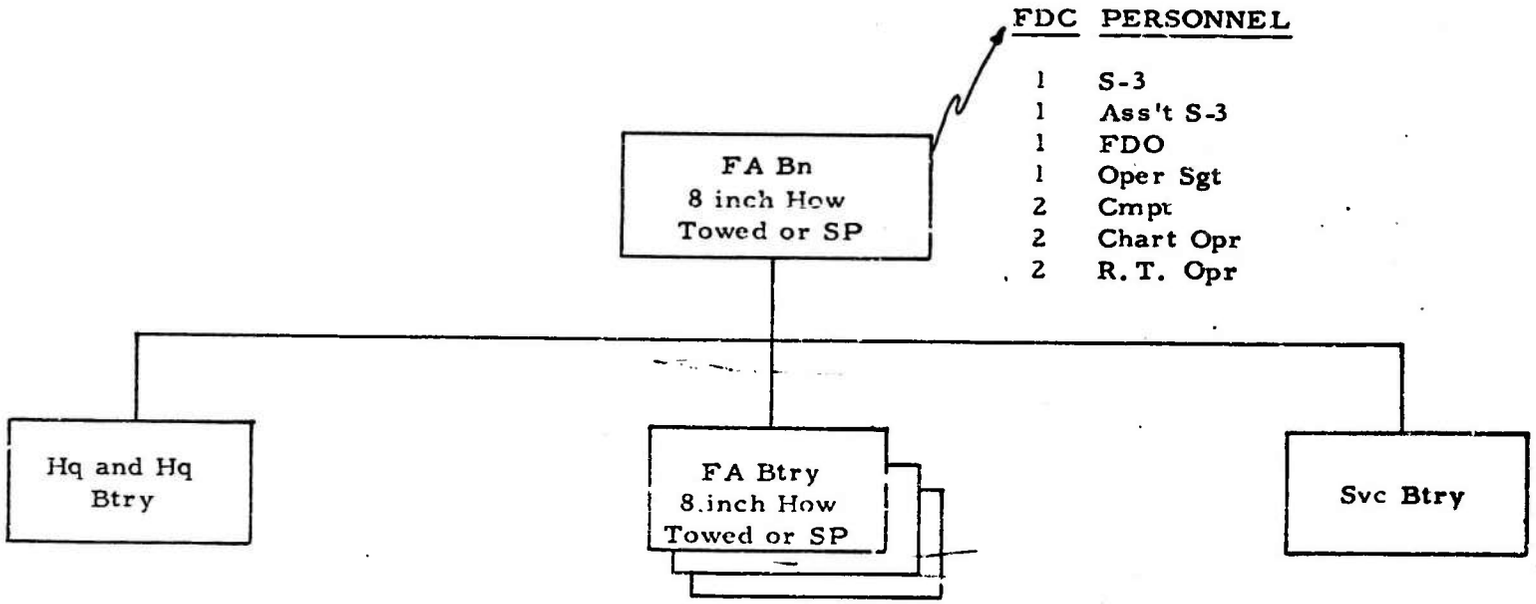
FA BTRY 155 mm HOW (TOWED) TOE 6-137C



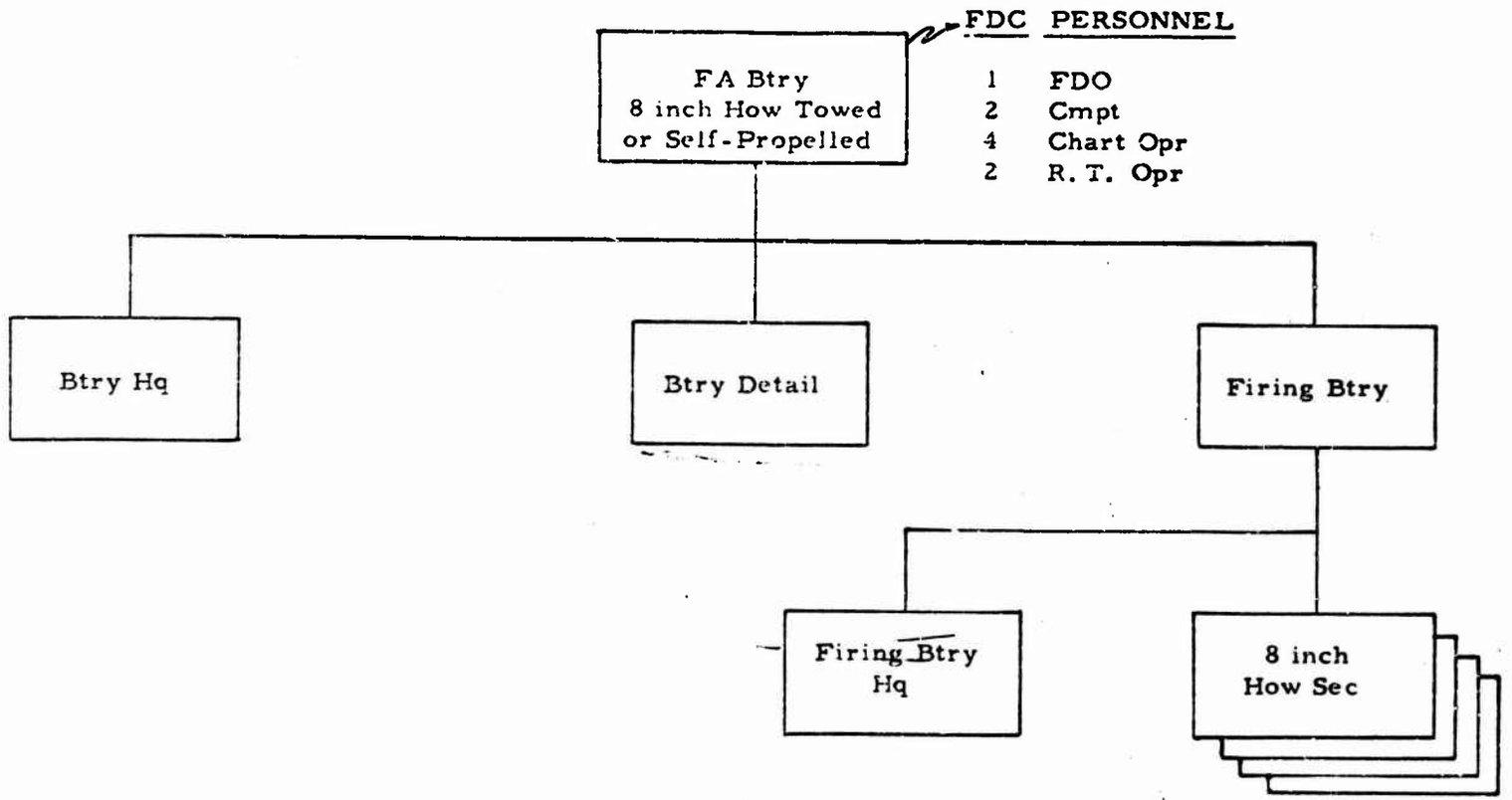
FA BATTALION, 155 mm GUN, (SP) TOE 435R



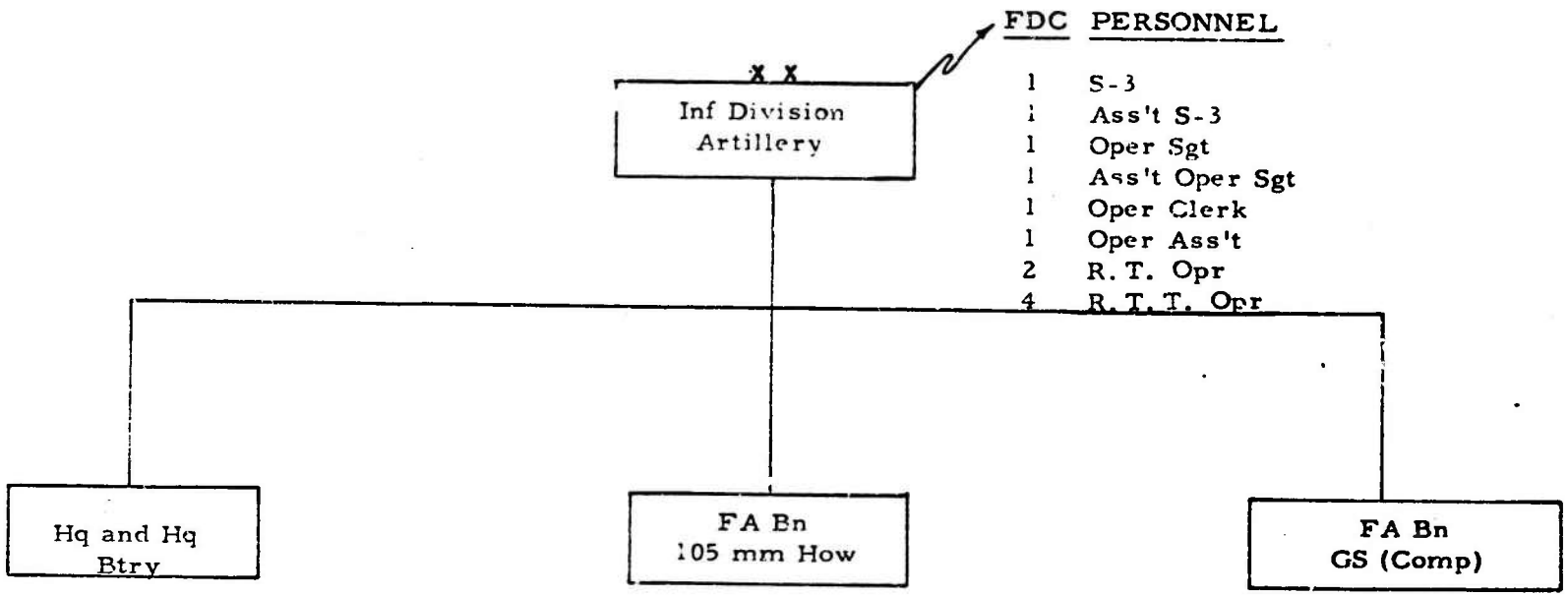
FA BTRY 155 mm GUN (SP) TOE 6-437R



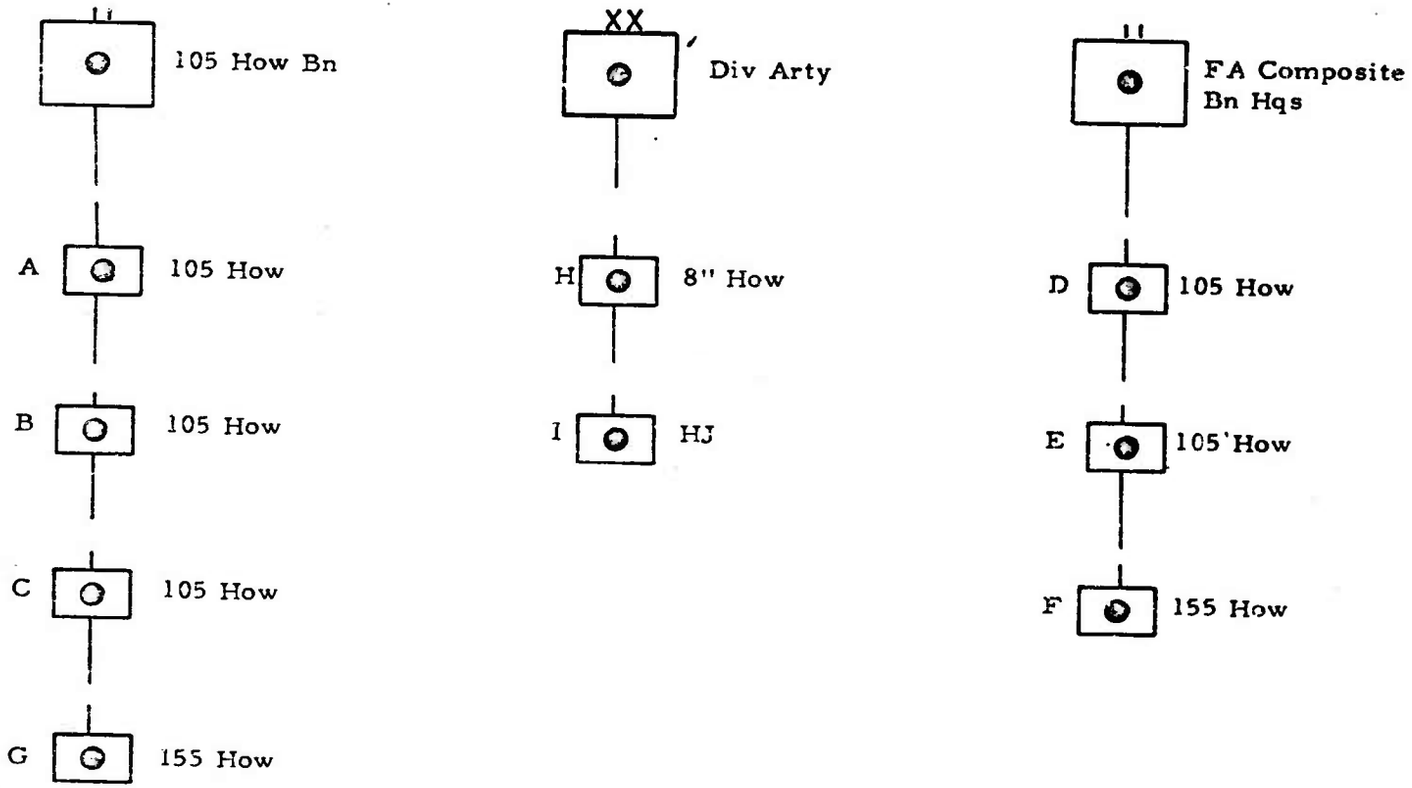
FA BATTALION, 8 inch HOW (TOWED or SP) TOE 6-415D
HQ and HQ BTRY, FA BATTALION, 8 inch HOW TOE 6-416D



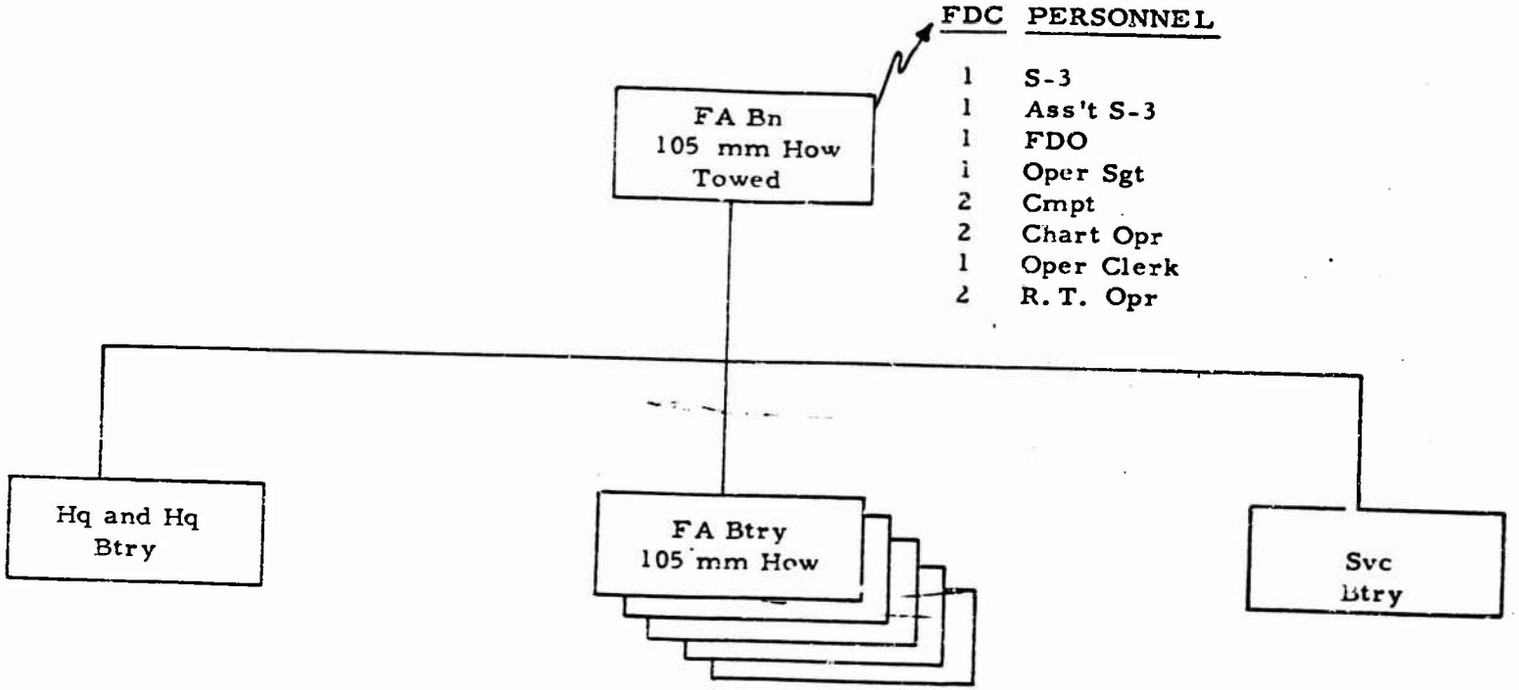
FA BTRY, 8 inch HOW (TOWED or SP) TOE 6-417D



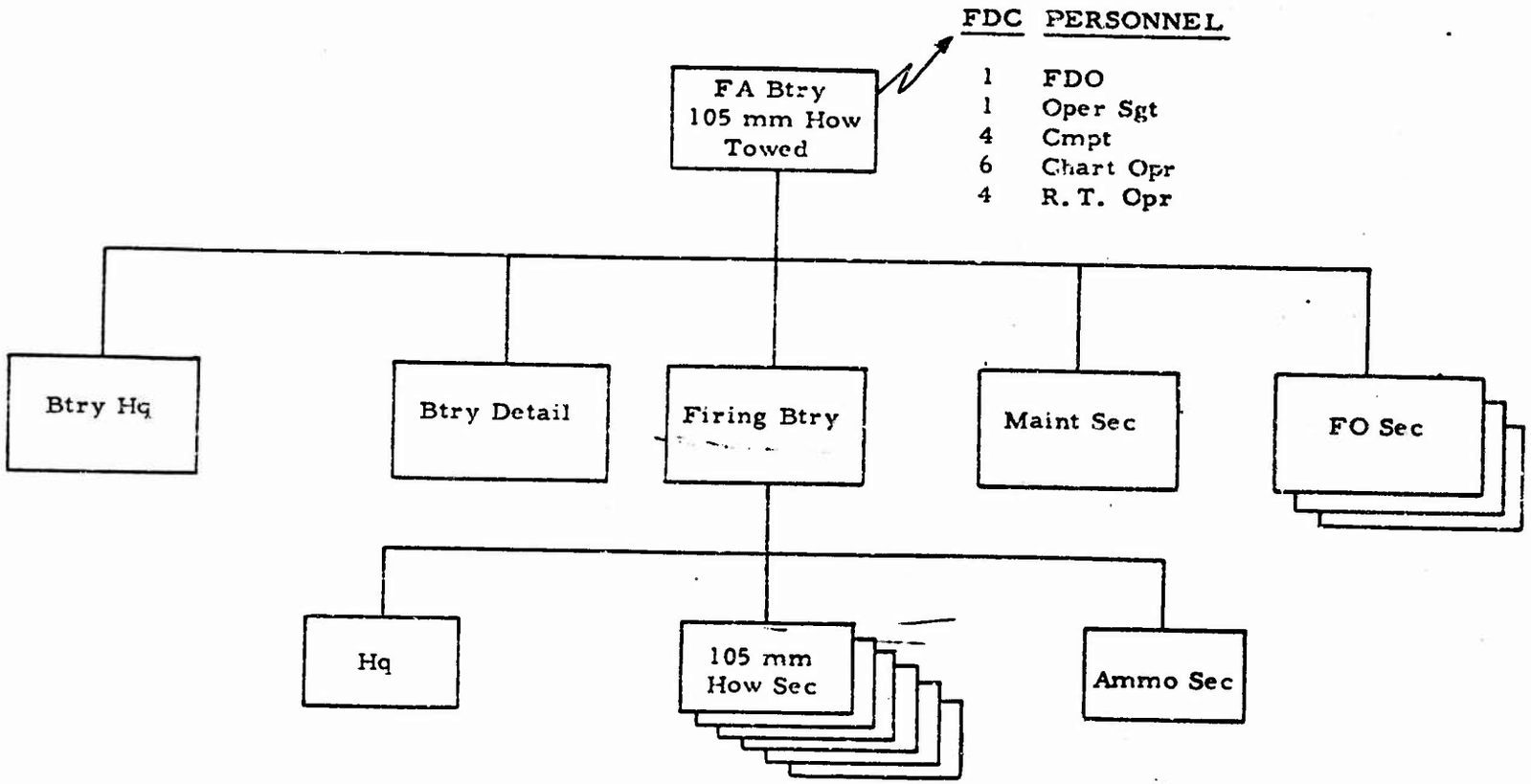
INFANTRY DIVISION ARTILLERY ROCID TOE 6-100T
HQ and HQ BTRY, INF DIVISION ARTILLERY TOE 6-101T



A PROPOSED ROCID DIV ARTY ORGANIZATION FOR COMBAT



FA BATTALION 105 mm HOW TOE 6-125T
HQ and HQ BTRY, FA BN, 105 mm HOW TOE 6-126T



FA BATTERY 105 mm HOW, TOWED TOE 6-127C

COMPOSITE BATTALION TOE 6-145T
HQ AND HQ BTRY, COMPOSITE BATTALION TOE 6-146T

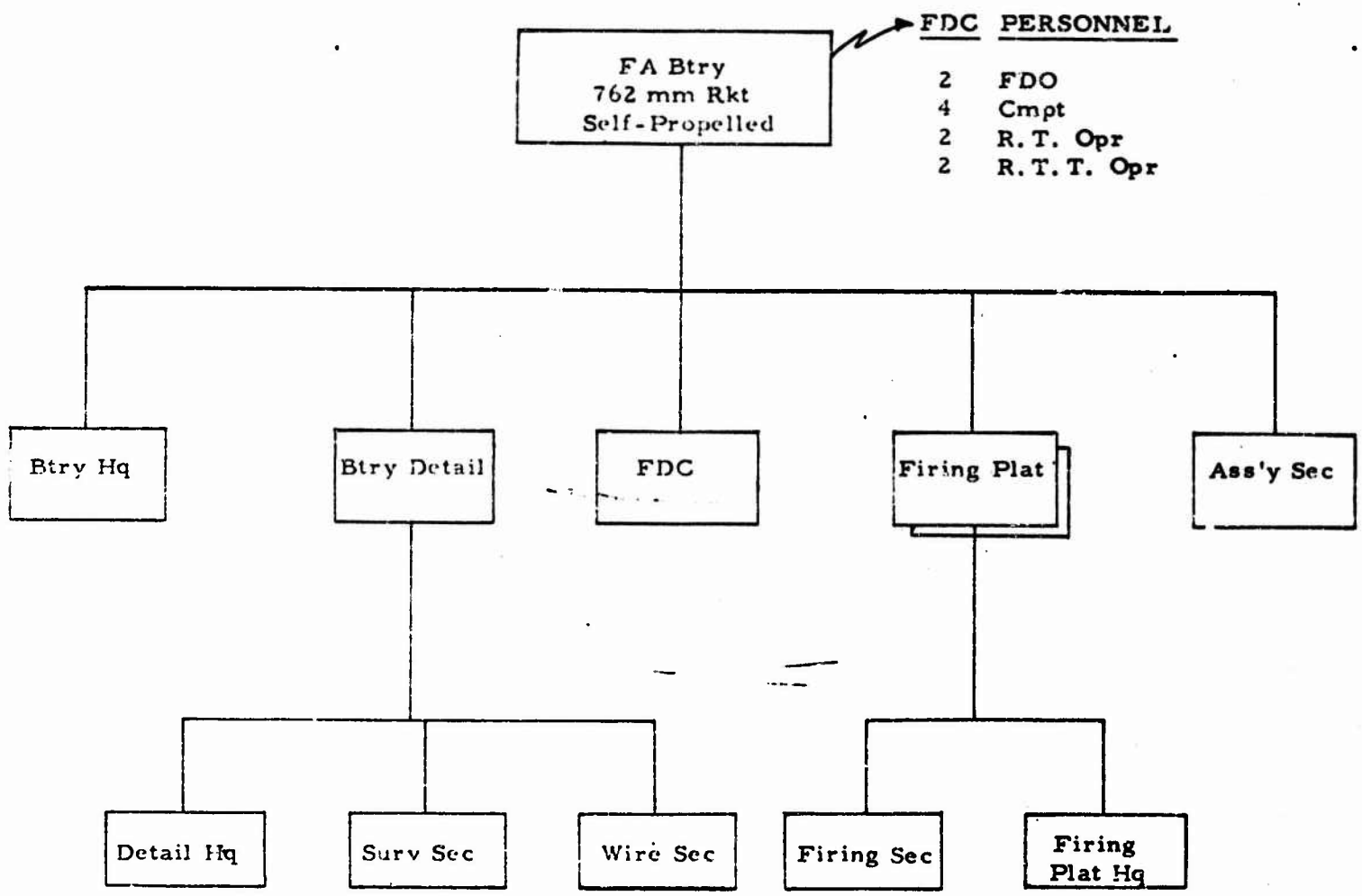
Appendix B to Annex 3

FA BTRY, 155 mm HOW TOE 6-147T

Appendix B to Annex 3

FA BTRY 8 inch HOW (TOWED) TOE 6-148

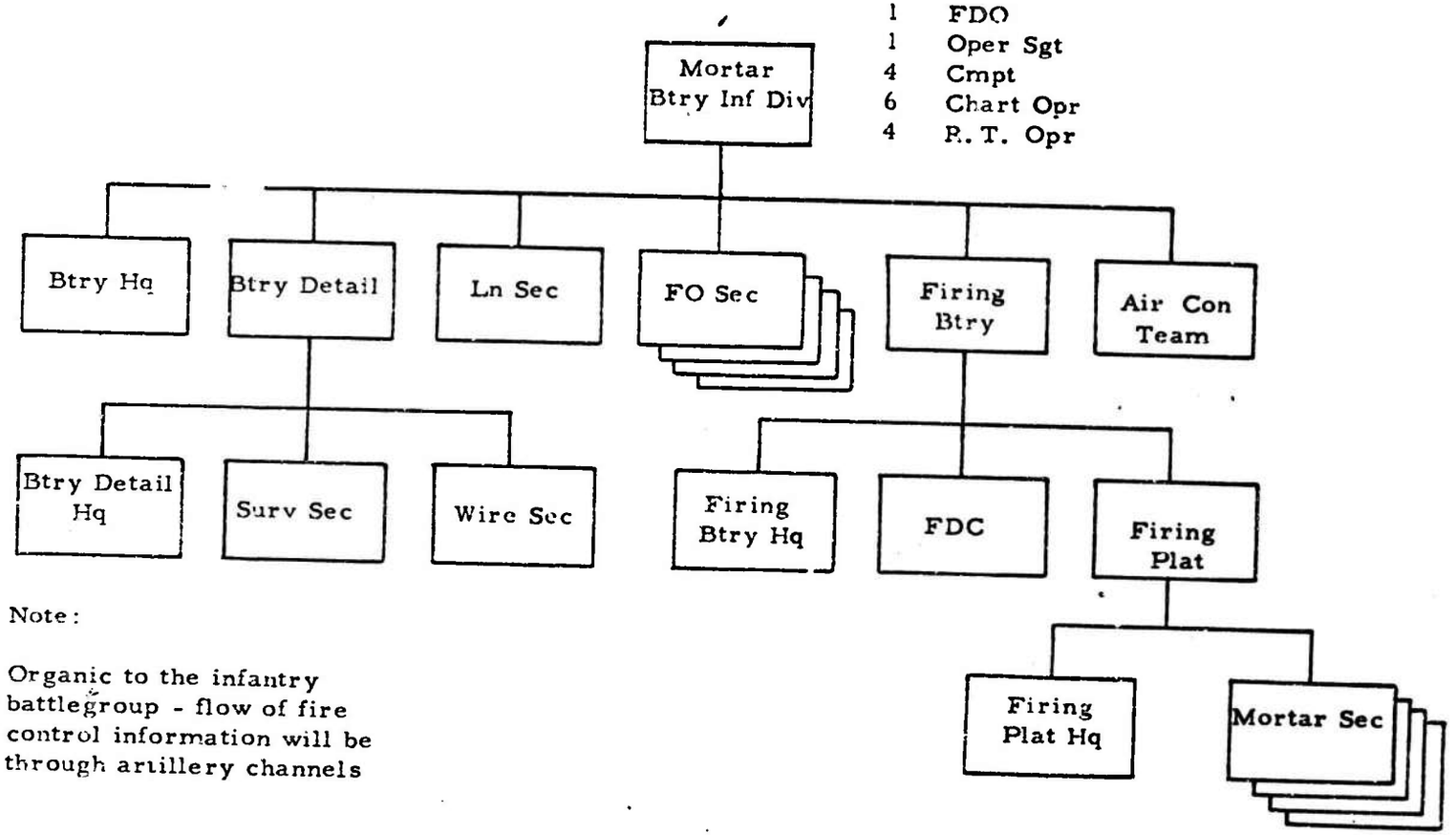
Appendix B to Annex 3



FA BTRY, 762 mm RKT TOE 6-150T

FDC PERSONNEL

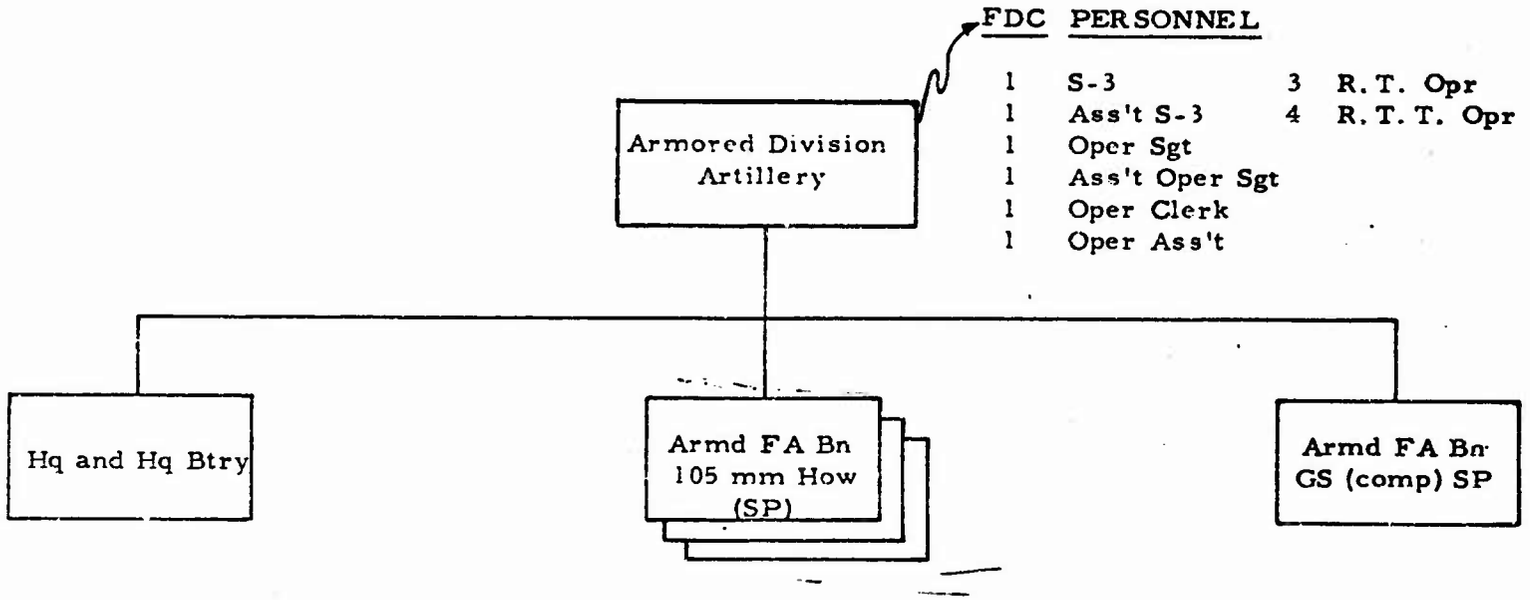
1	FDO
1	Oper Sgt
4	Cmpt
6	Chart Opr
4	R. T. Opr



Note:

Organic to the infantry battlegroup - flow of fire control information will be through artillery channels

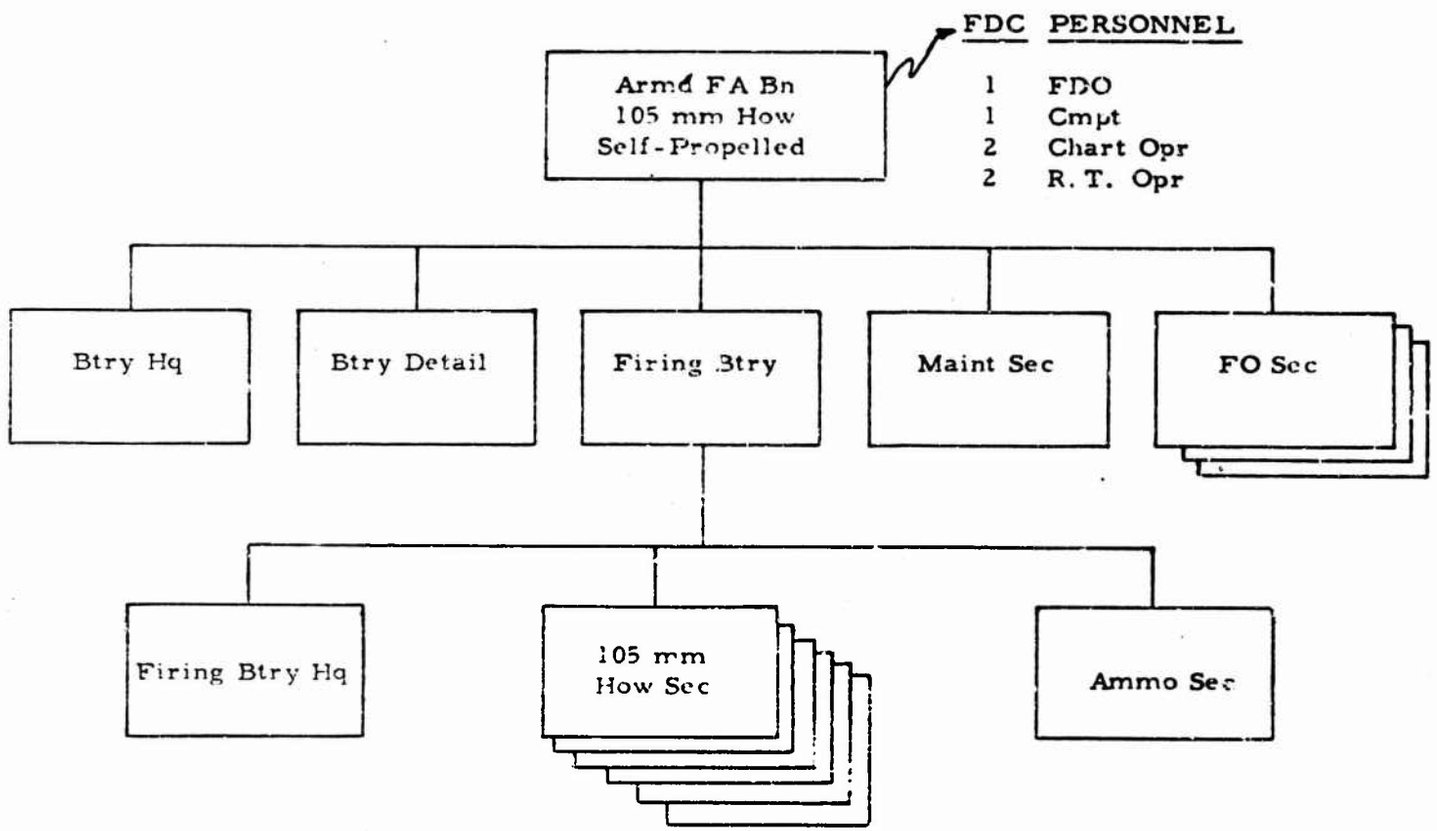
4.2 INCH MORTAR BATTERY TOE 6-18T



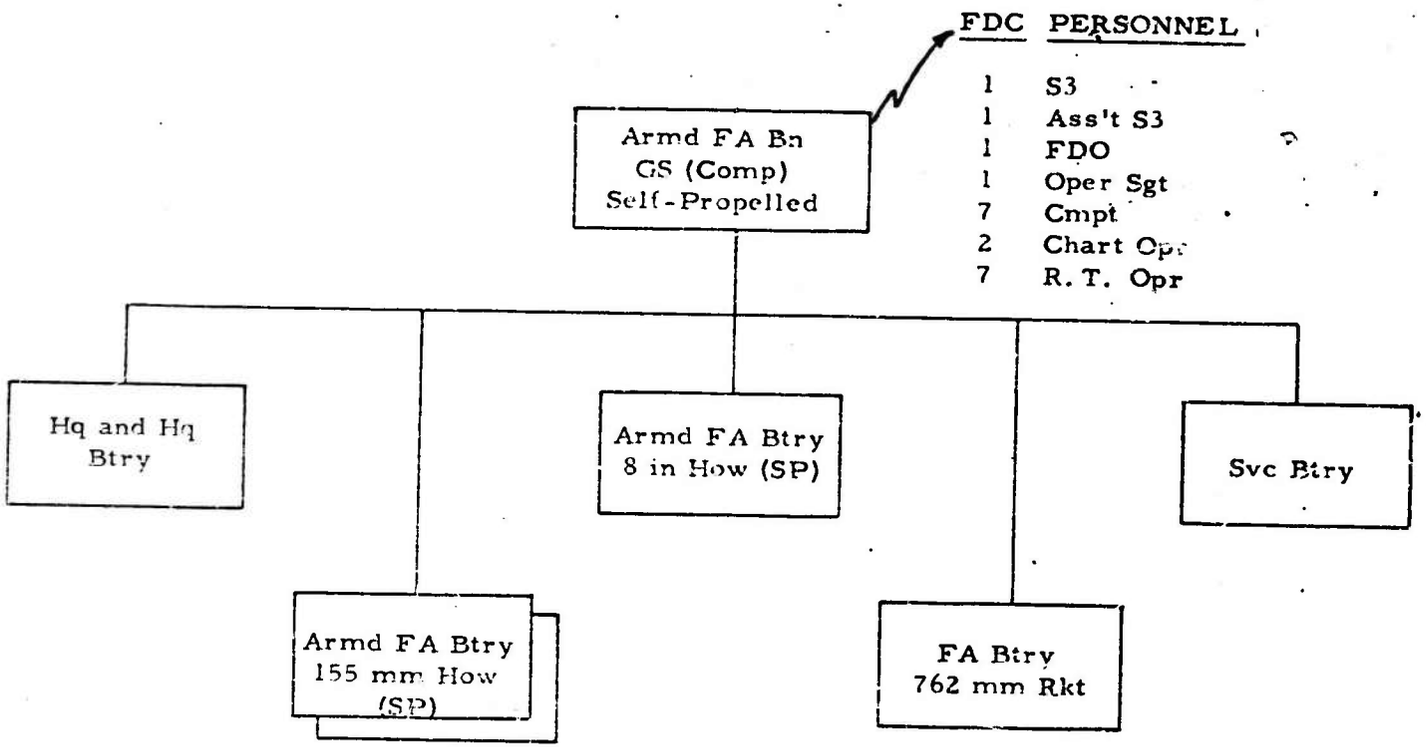
ARMORED DIVISION ARTILLERY, ROCAD TOE 6-300C
HQ and HQ BTRY ARMORED DIVISION ARTILLERY ROCAD TOE 6-301C

ARMD FA BN 105 mm HOW (SP) TOE 6-315T
HQ and HQ BTRY, ARMD FA BN 105mm How (SP) TOE 6-316T

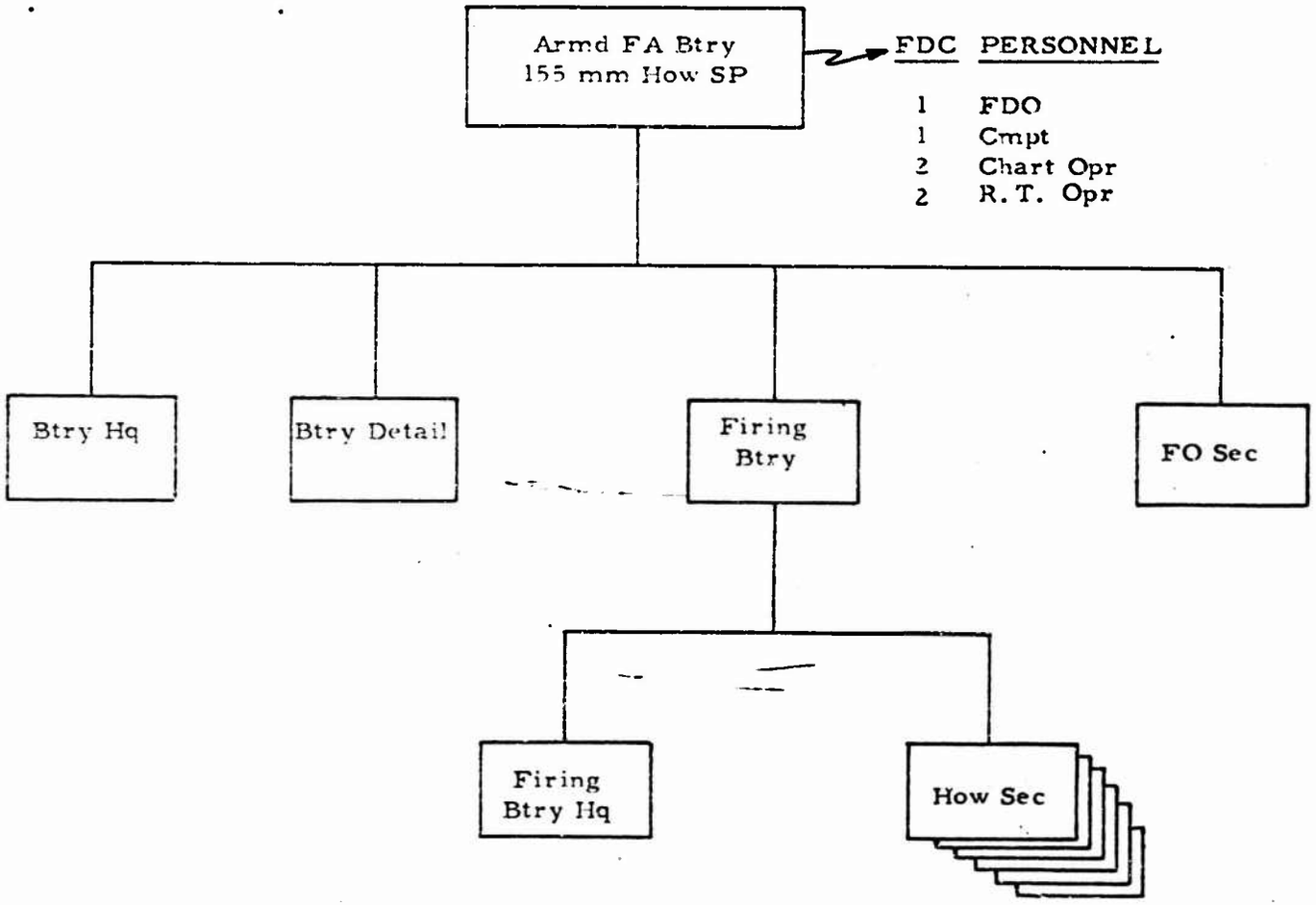
Appendix B to Annex 3



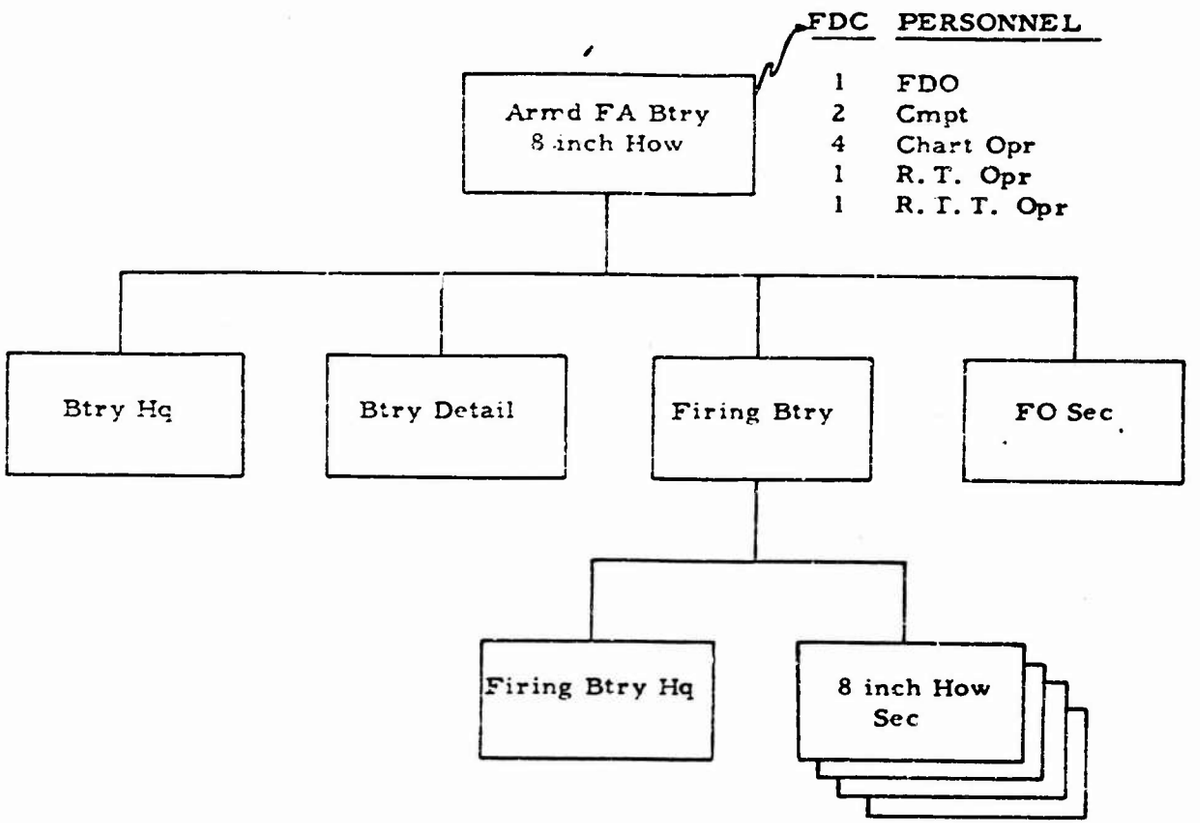
ARMD FA BN, 105 mm HOW, (SP) TOE 6-317C



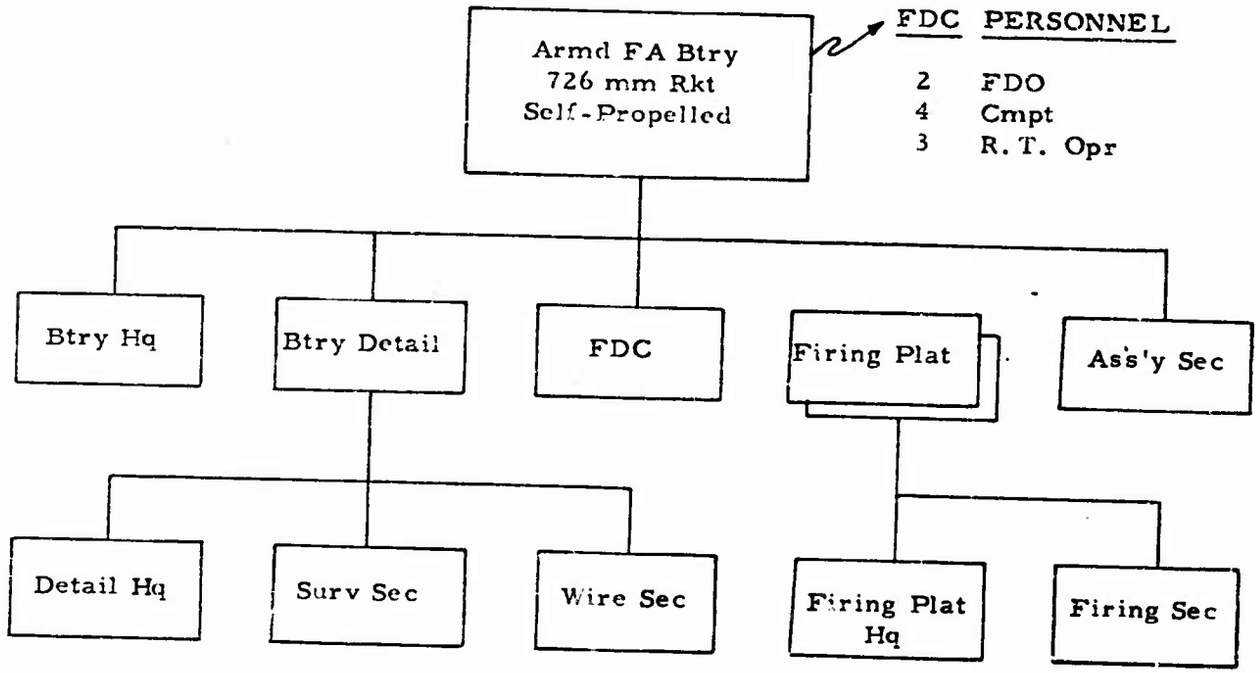
COMPOSITE BATTALION TOE 6-325C
HQ and HQ BTRY COMPOSITE BATTALION TOE 6-326 C



ARMD FA BTRY 155 mm HOW (SP) TOE 6-327C

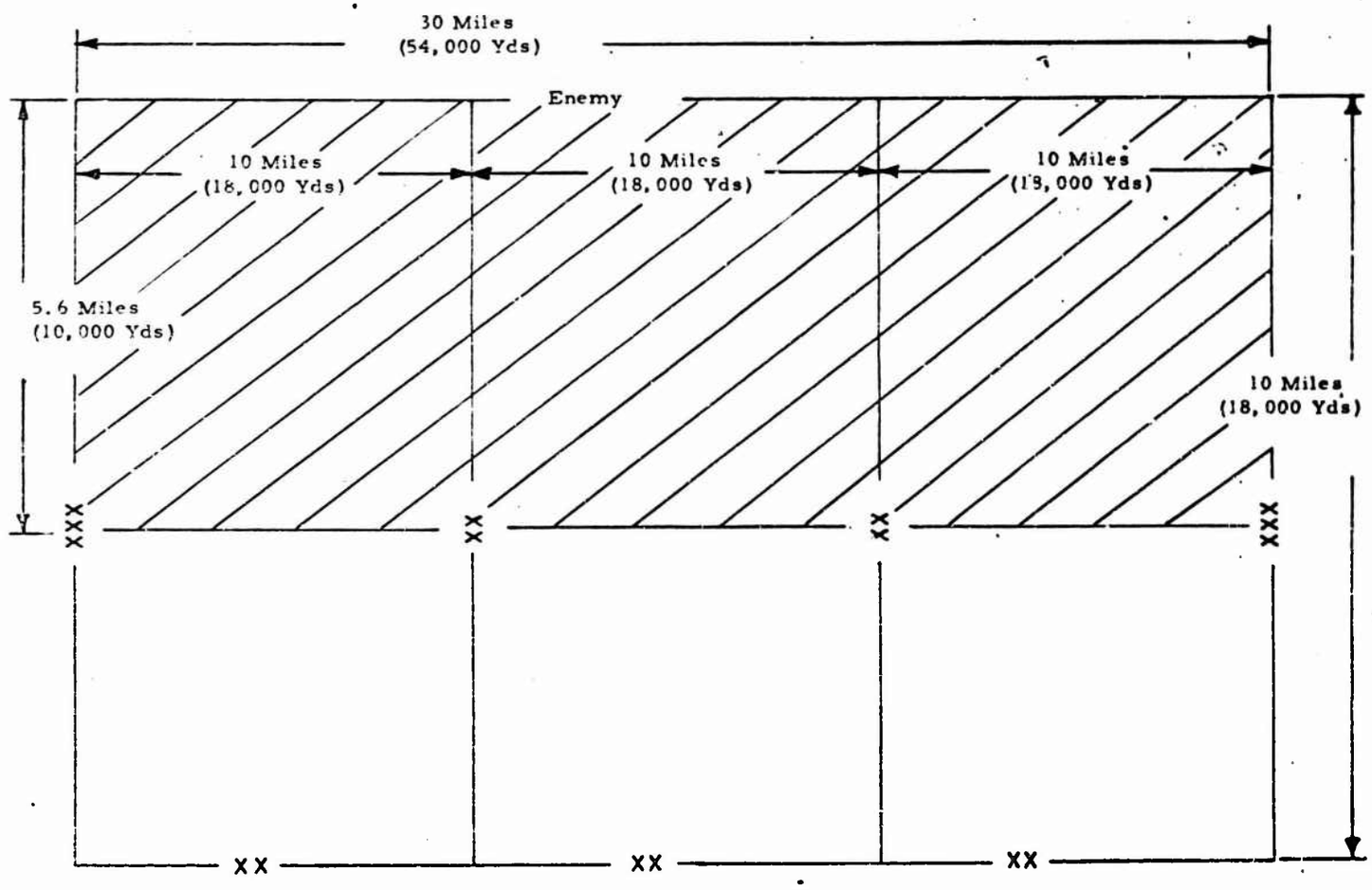


ARMD FA BTRY, 8 inch HOW (SP) TOE 6-328T



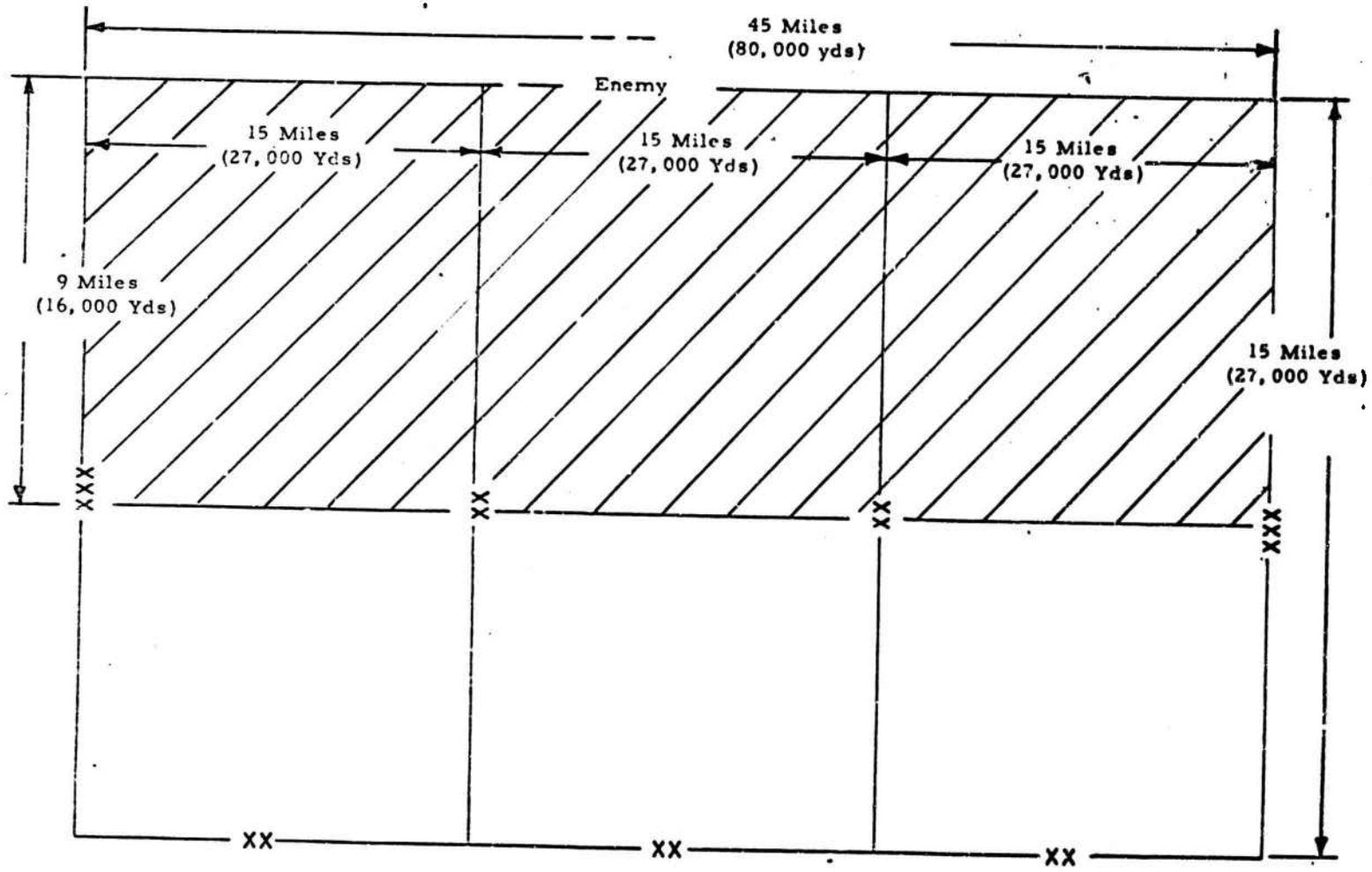
ARMD FA BTRY, 762 mm RKT (SP) TOE 6-330T

TYPICAL DISTANCES, CORPS IN OFFENSE



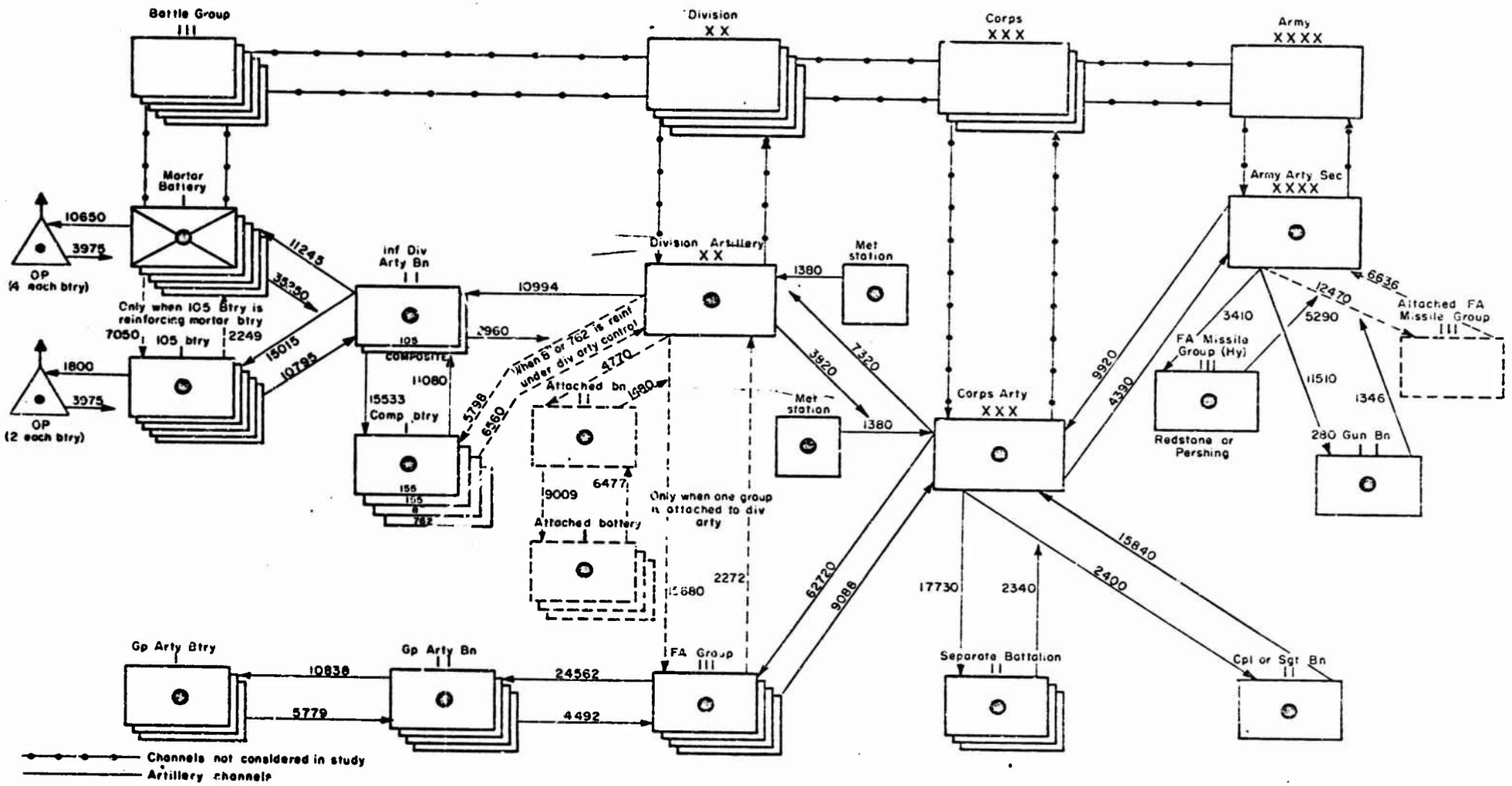
//// - MAX AREA OCCUPIED BY ARTY WITH THE CORPS

TYPICAL DISTANCES, CORPS IN DEFENSE



//// = MAX. AREA OCCUPIED BY ARTY WITH THE CORPS

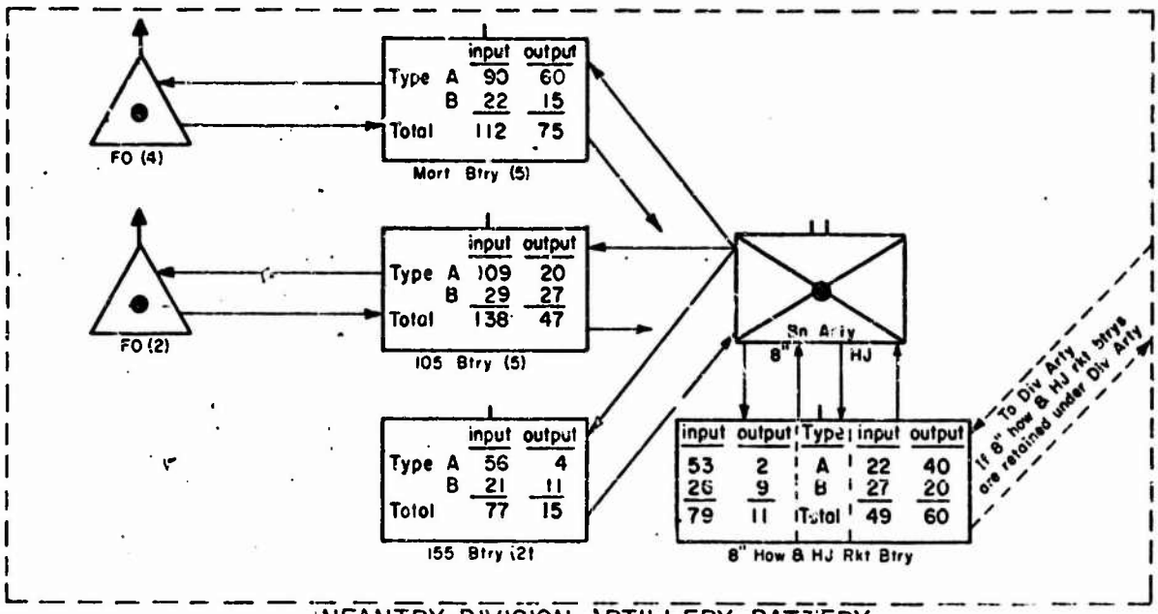
GENERAL AREA-ARTILLERY FIRE CONTROL (MANUAL)



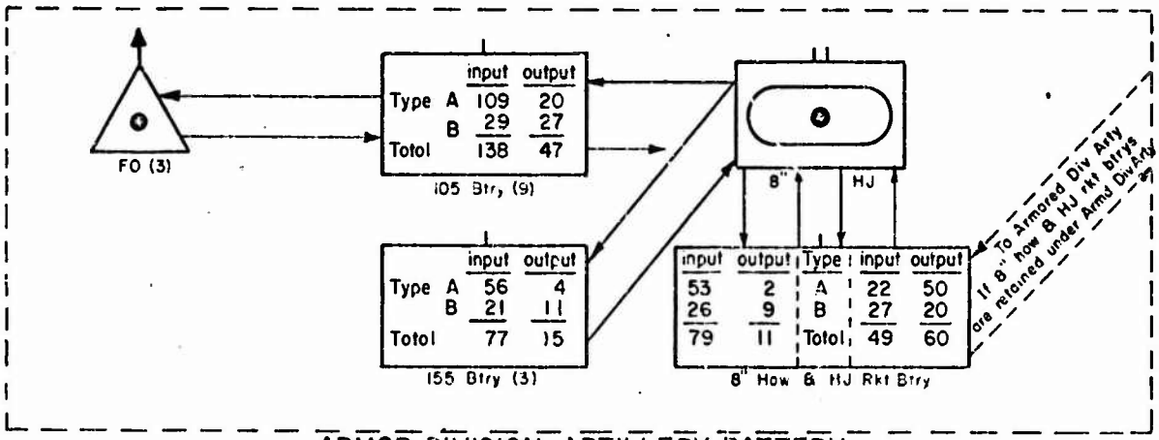
SKELETON FLOW CHART (PRESENT, MANUAL)

Appendix C_1 Annex 3

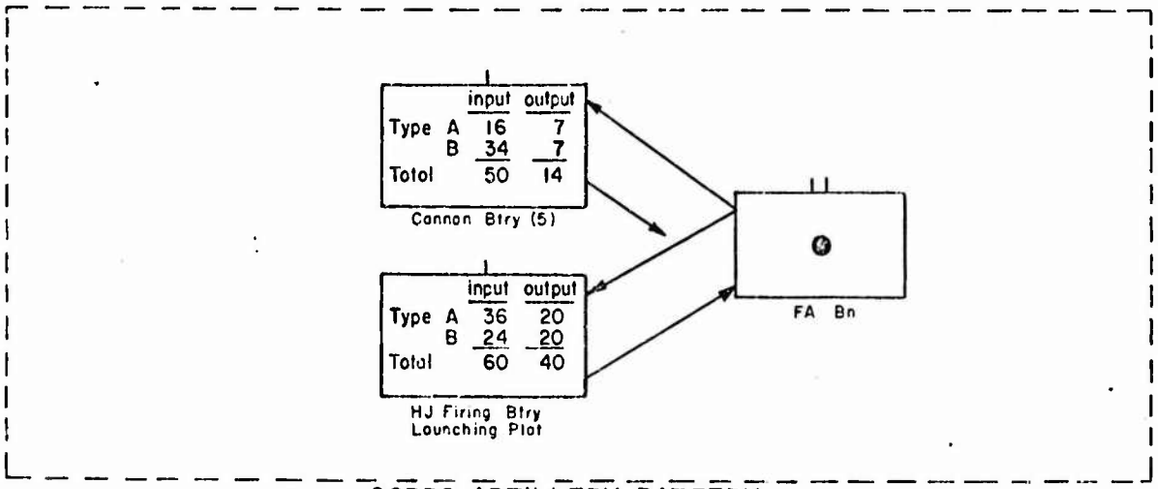
GENERAL AREA - ARTILLERY FIRE CONTROL (MANUAL)
SPECIFIC AREA - BATTERY



INFANTRY DIVISION ARTILLERY BATTERY



ARMOR DIVISION ARTILLERY BATTERY



CORPS ARTILLERY BATTERY

Appendix C_2 Annex 3

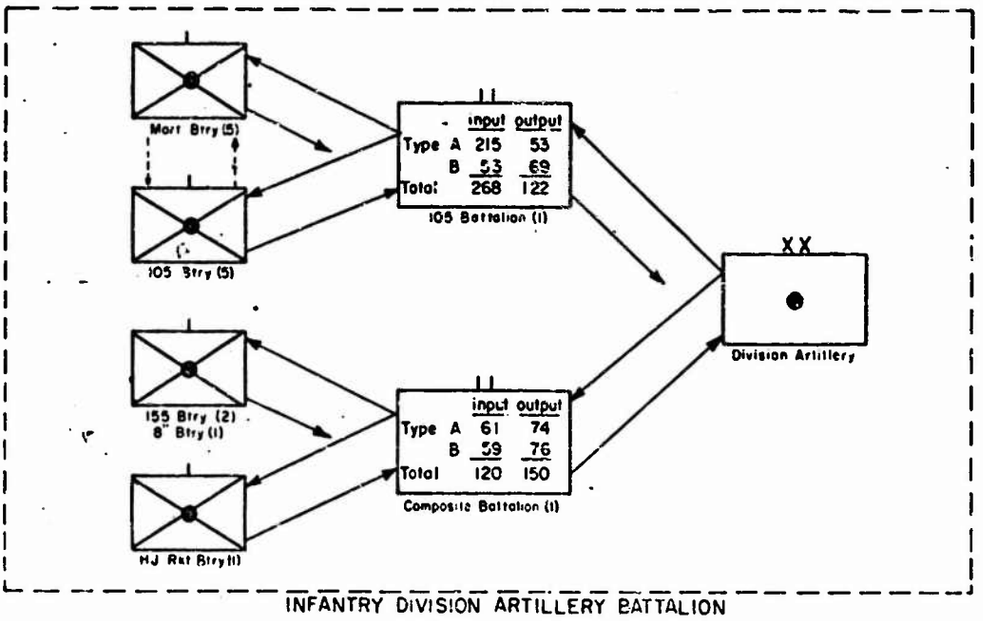
REPORTS

TYPE A - INPUTS/OUTPUTS GENERATED DURING CONDUCT OF FIRE.

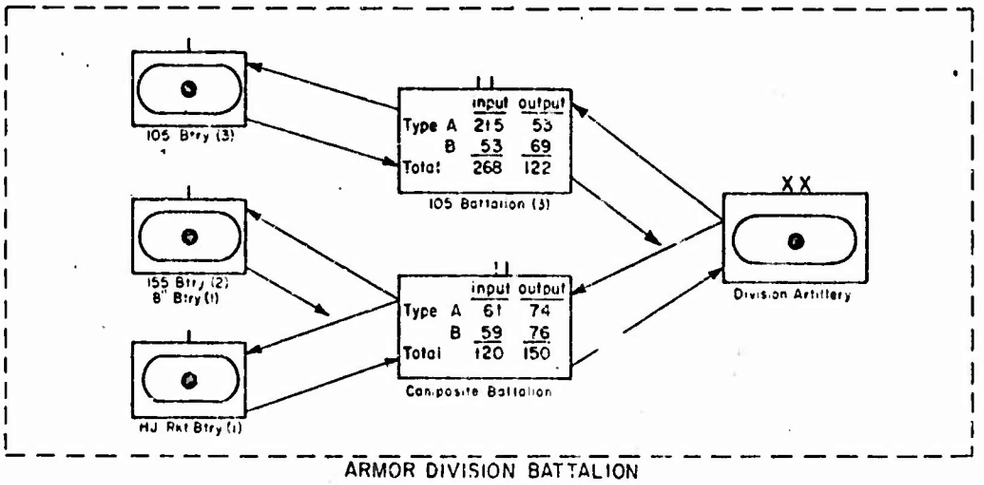
TYPE B - INPUTS/OUTPUTS GENERATED TO INCREASE EFFECTIVENESS OR AS A RESULT OF FIRE MISSIONS.

ALL REPORTS MORE THAN 1 LINE ITEM AND LESS THAN 56.

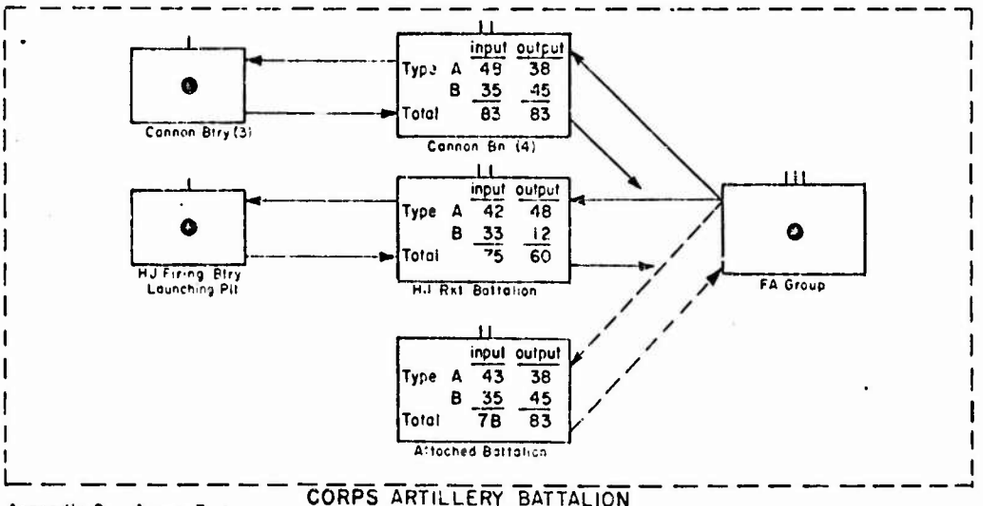
GENERAL AREA - ARTILLERY FIRE CONTROL (MANUAL)
SPECIFIC AREA - BATTALION



INFANTRY DIVISION ARTILLERY BATTALION



ARMOR DIVISION BATTALION



CORPS ARTILLERY BATTALION

Appendix C_3 Annex 3

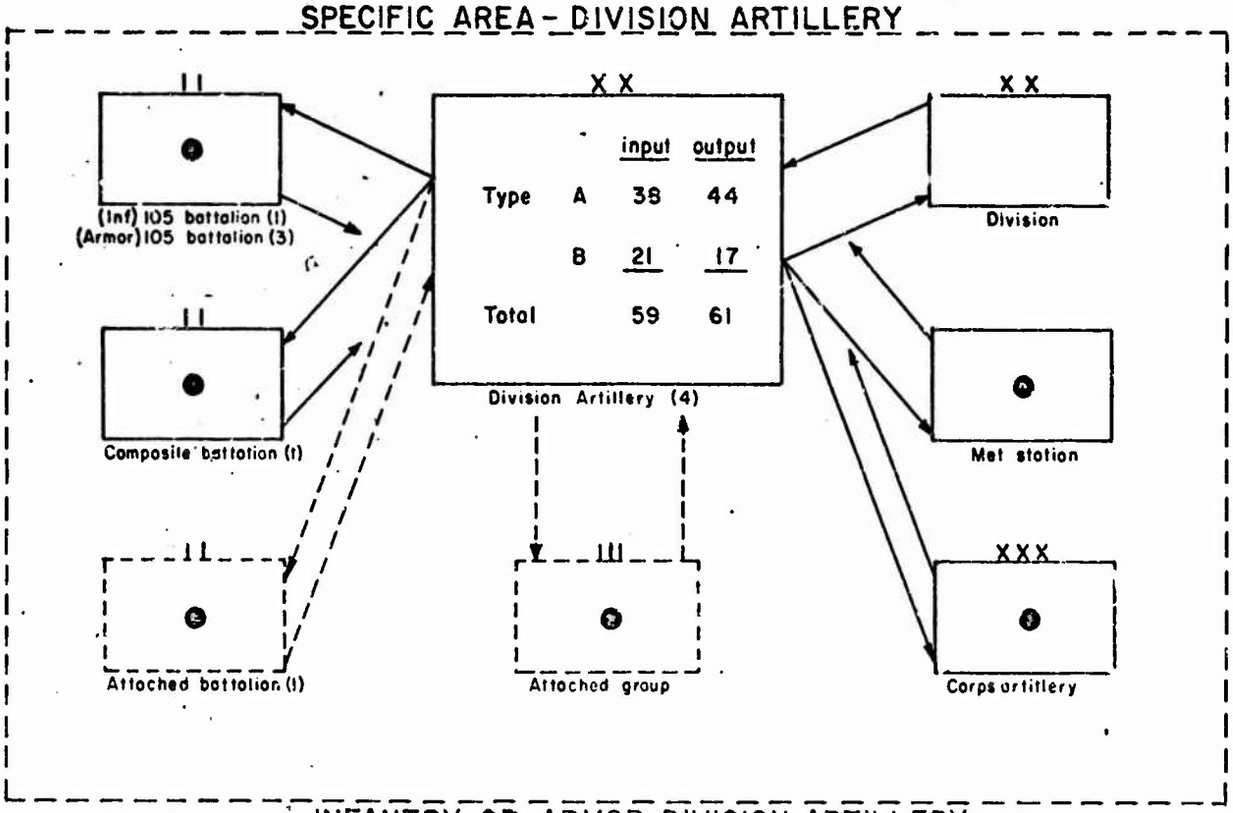
Reports

TYPE A - Inputs/Outputs generated during conduct of fire.

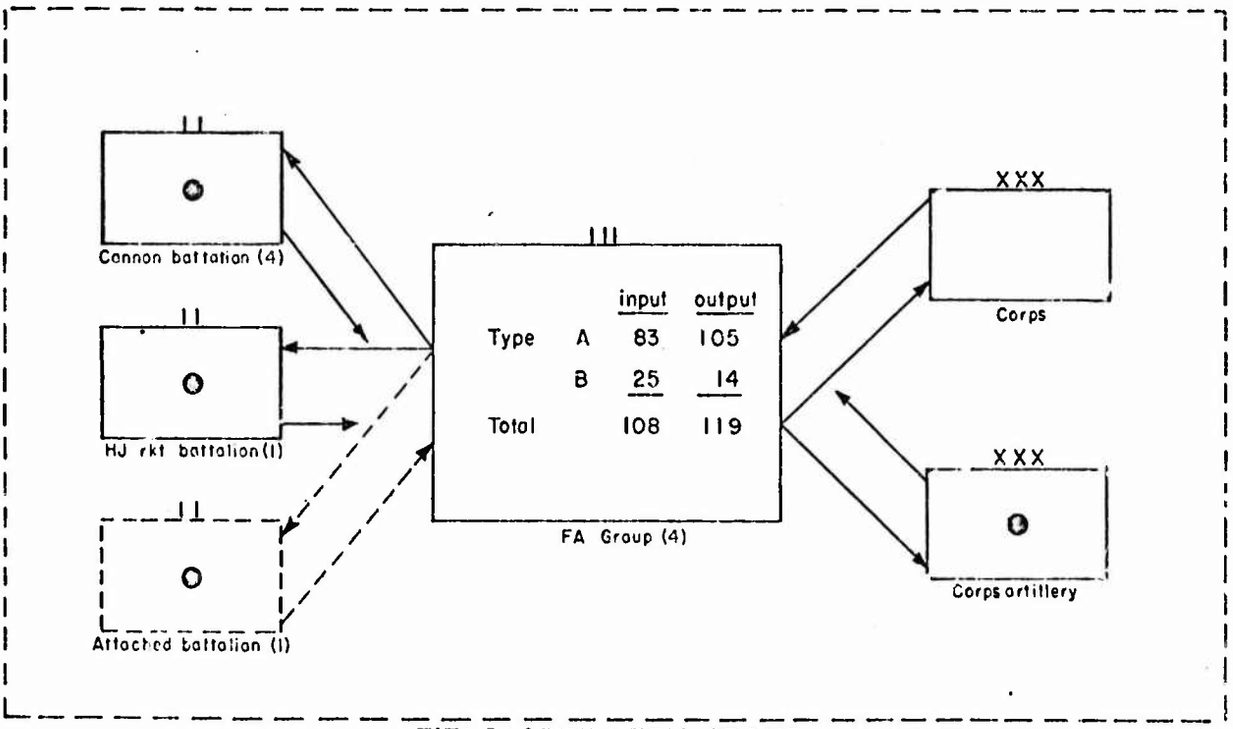
TYPE B - Inputs/Outputs generated to increase effectiveness or as a result of fire missions.

All reports more than 1 line item and less than 50.

GENERAL AREA - ARTILLERY FIRE CONTROL (MANUAL)
SPECIFIC AREA - DIVISION ARTILLERY



INFANTRY OR ARMOR DIVISION ARTILLERY



FIELD ARTILLERY GROUP

Appendix C_4 Annex 3

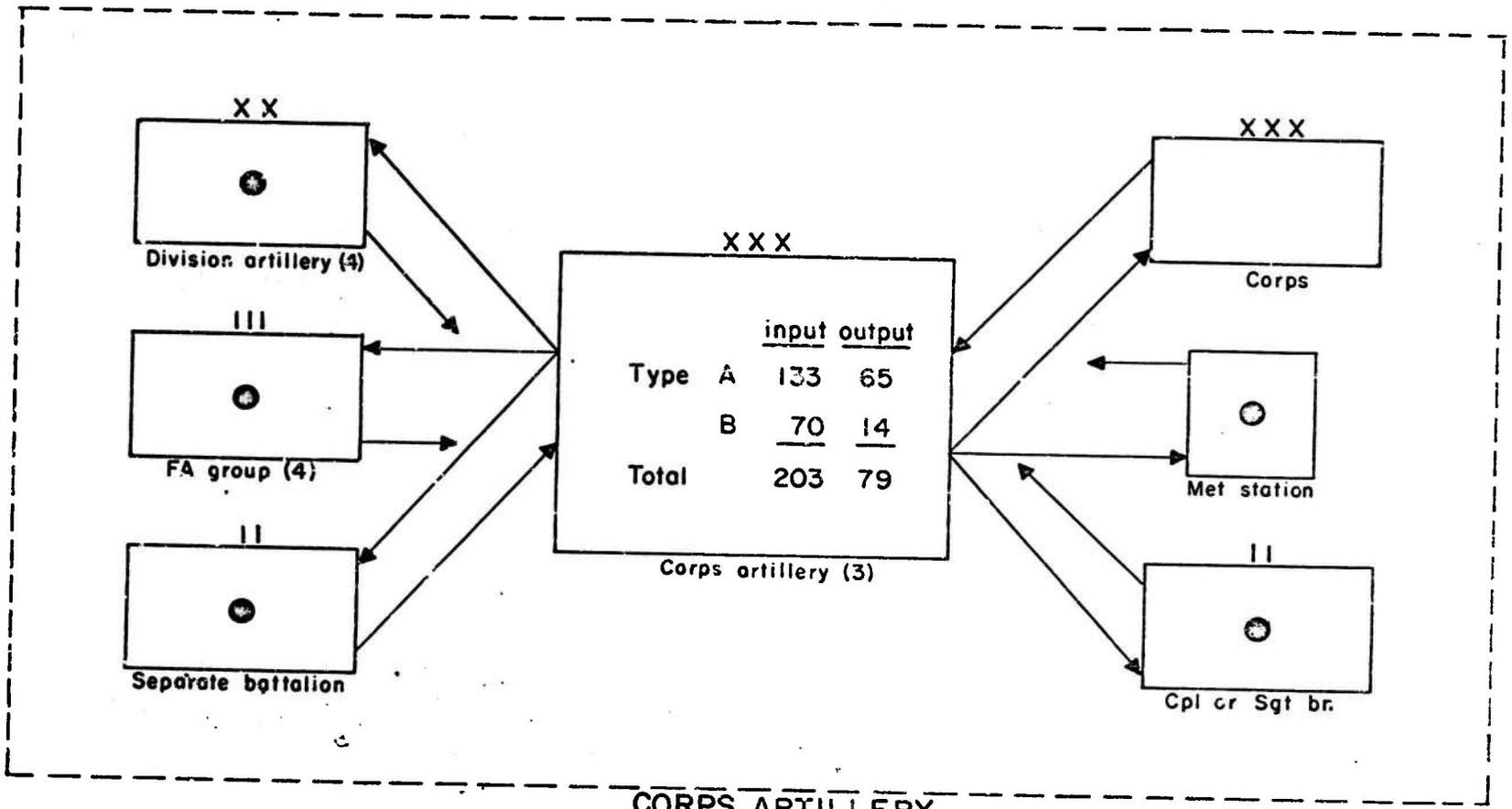
REPORTS

TYPE A - INPUTS/OUTPUTS GENERATED DURING CONDUCT OF FIRE.

TYPE B - INPUTS/OUTPUTS GENERATED TO INCREASE EFFECTIVENESS OR AS A RESULT OF FIRE MISSIONS.

ALL REPORTS MORE THAN 1 LINE ITEM AND LESS THAN 50.

GENERAL AREA - ARTILLERY FIRE CONTROL (MANUAL)
SPECIFIC AREA - CORPS ARTILLERY



CORPS ARTILLERY

Appendix C_5 Annex 3

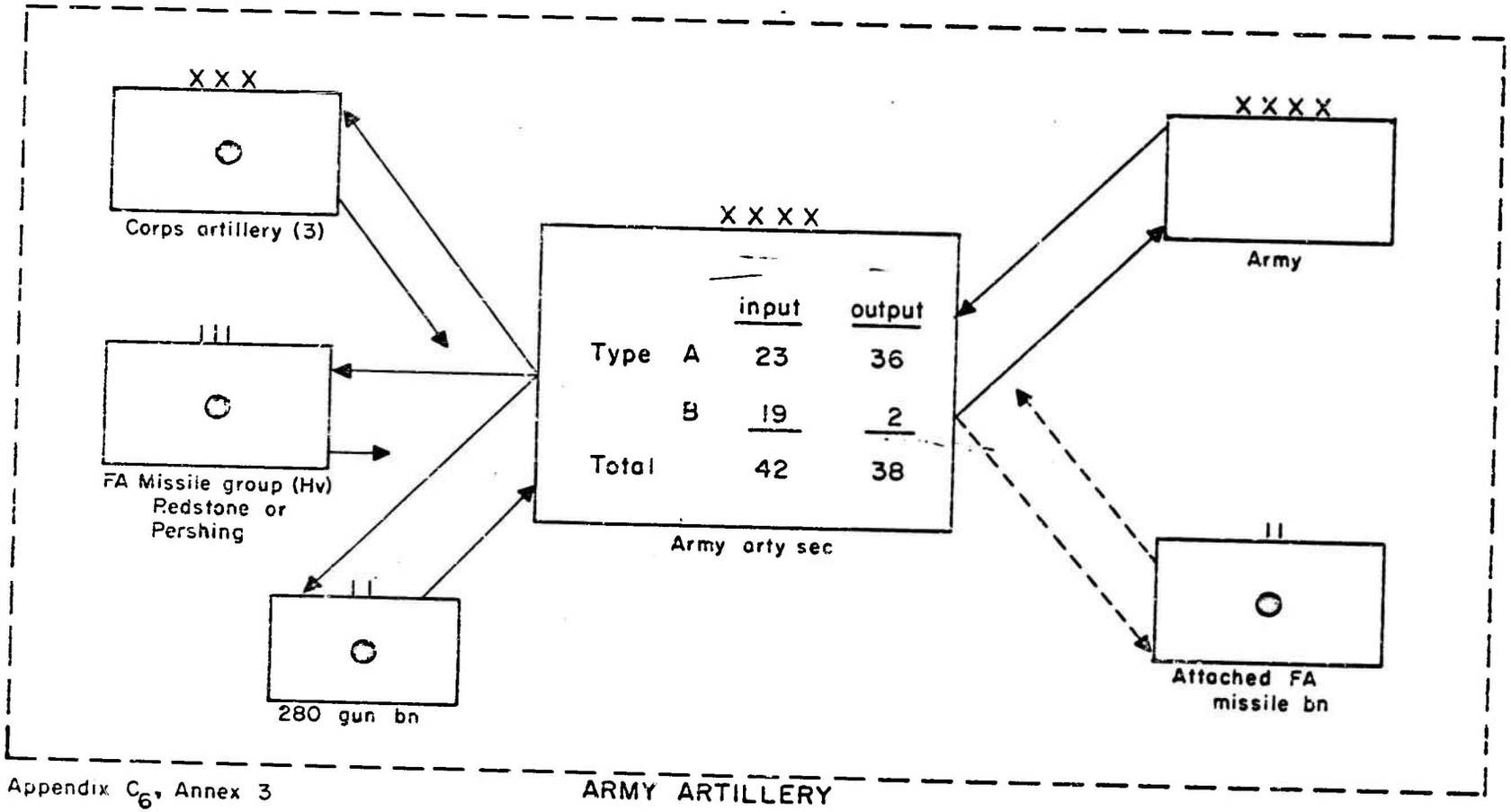
Reports

TYPE A – Inputs/Outputs generated during conduct of fire

TYPE B – Inputs/Outputs generated to increase effectiveness or as a result of fire missions

All reports more than 1 line item and less than 50.

GENERAL AREA - ARTILLERY FIRE CONTROL (MANUAL)
SPECIFIC AREA - ARMY ARTILLERY



Appendix C_6, Annex 3

ARMY ARTILLERY

Reports

TYPE A - Inputs/Outputs generated during conduct of fire.
TYPE B - Inputs/Outputs generated to increase effectiveness, or as a result of fire missions.

All reports more than 1 line item and less than 50.

ANNEX 4

DETAILED PROCEDURAL EVALUATION

APPENDICES:

A. Goals of the Organization

B. Data Required

APPENDIX A TO ANNEX 4

GOALS OF THE ORGANIZATIONS

1. The goals of the field artillery in combat are:

a. Support the ground gaining arms by fire, neutralizing or destroying those targets which are most dangerous to the supported arms.

b. Give depth to combat and insolate the battlefield by counterfire, by fire on hostile reserves, by restricting movement in rear areas, and by disrupting hostile command facilities and other installations.

2. The goals of field artillery fire direction are to insure:

a. Continuous, accurate, and timely artillery fire support under all conditions of weather, visibility and terrain.

b. Coordination of artillery fires and integration with the fires of other fire support units.

c. Flexibility of artillery fires sufficient to engage all types of targets.

d. Prompt massing of artillery fires of all available units in any area within range.

e. Rapid delivery of artillery fire within the zone or sector of the supported unit or force.

f. Control of artillery fire through orders, policies and priorities by means of adequate communication and liaison.

g. Target intelligence.

3. The goal of technical fire control is to place accurate fire on the target in the shortest possible time under all conditions.

APPENDIX B TO ANNEX 4

DATA REQUIRED TO ACHIEVE ORGANIZATIONAL GOALS

The data required to achieve the organizational goals are as defined in Annex 3, Appendix A, Input, Output, and File Definition.

ANNEX 5

PROPOSED SYSTEM - MANUAL

1. As discussed in Section 4, paragraphs 7-8 the primary difference between the present system and the proposed manual system was the addition of weapon system computers. These computers will provide a solution for the fire control problem; they will provide the stimulation to intensify the search for more accurate and rapid input/output means; however, they will not be tied into a computer network.

2. Based upon this concept (paragraph 1 above) the following has been omitted from this portion of the study to avoid repetition.

a. Appendix A - Input, Output and File Definition

b. Appendix B - Organization Definition

c. Appendix C - Flow Charts

APPENDIX A TO ANNEX 6

INPUT, OUTPUT, AND FILE DEFINITION

1. The inputs and outputs to the proposed ADFS at all levels are the same as those currently employed in the manual system and are described in Appendix A to Annex 3.

2. As pointed out in Section V of this study, the greatest advantages of the proposed system will be the rapid and accurate transmission, storage and retrieval of information. It becomes apparent that the necessity for the preparation and transmission of hand copy can be eliminated at all levels since the information can be passed electronically from computer to computer. In like manner, it is visualized that the system can be queried at any level to produce, not-less-than-one-hour-old information. The flow of these data are illustrated graphically in Appendix D to this annex.

ANNEX 6

PROPOSED SYSTEM - ADP

APPENDICES:

A. Input, Output, and File Definition

B. Organization Definition

C. Flow Charts

D. Master Logical Flow Chart

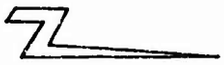
APPENDIX B TO ANNEX 6

ORGANIZATION DEFINITION

1. The same organization as shown in Appendix C to Annex 3 will be used.

2. The employment of ADPS for field artillery fire control will not require or permit an organizational change in the fire direction personnel now specified for each headquarters. Present personnel at each level currently required for normal manual operations would be adequate if trained to operate the fire control computers and the various pieces of ADPS equipment.

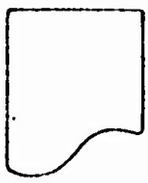
CHARTING SYMBOLS



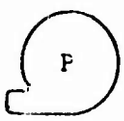
Communication Circuit

Operations

Visual Display



Hard Copy



Paper Tape

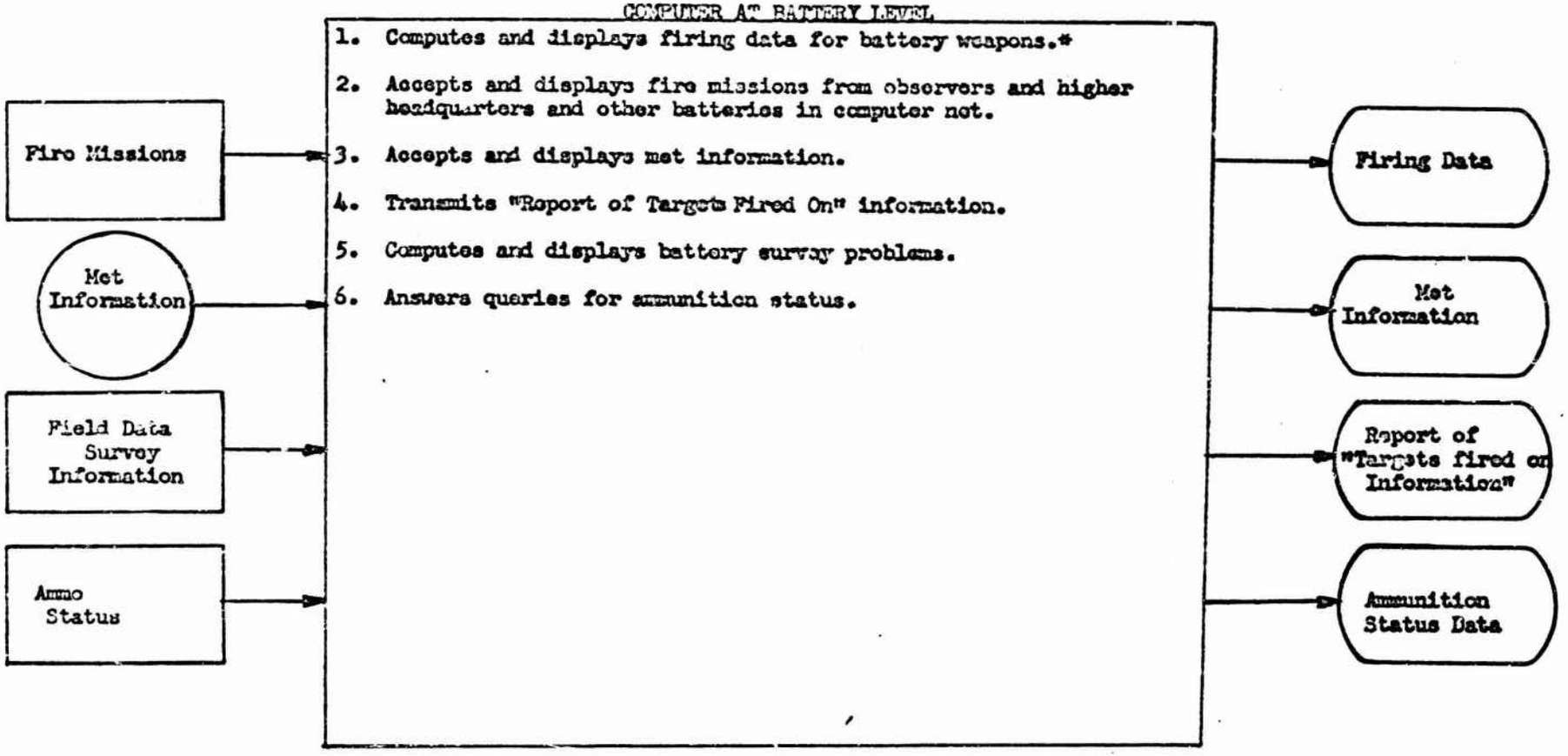
Magnetic Tape

Connector

GENERAL AREA: Field Artillery Technical Fire Control Input/Output Data

GENERAL APPLICATION FLOW CHART

BATTERY LEVEL

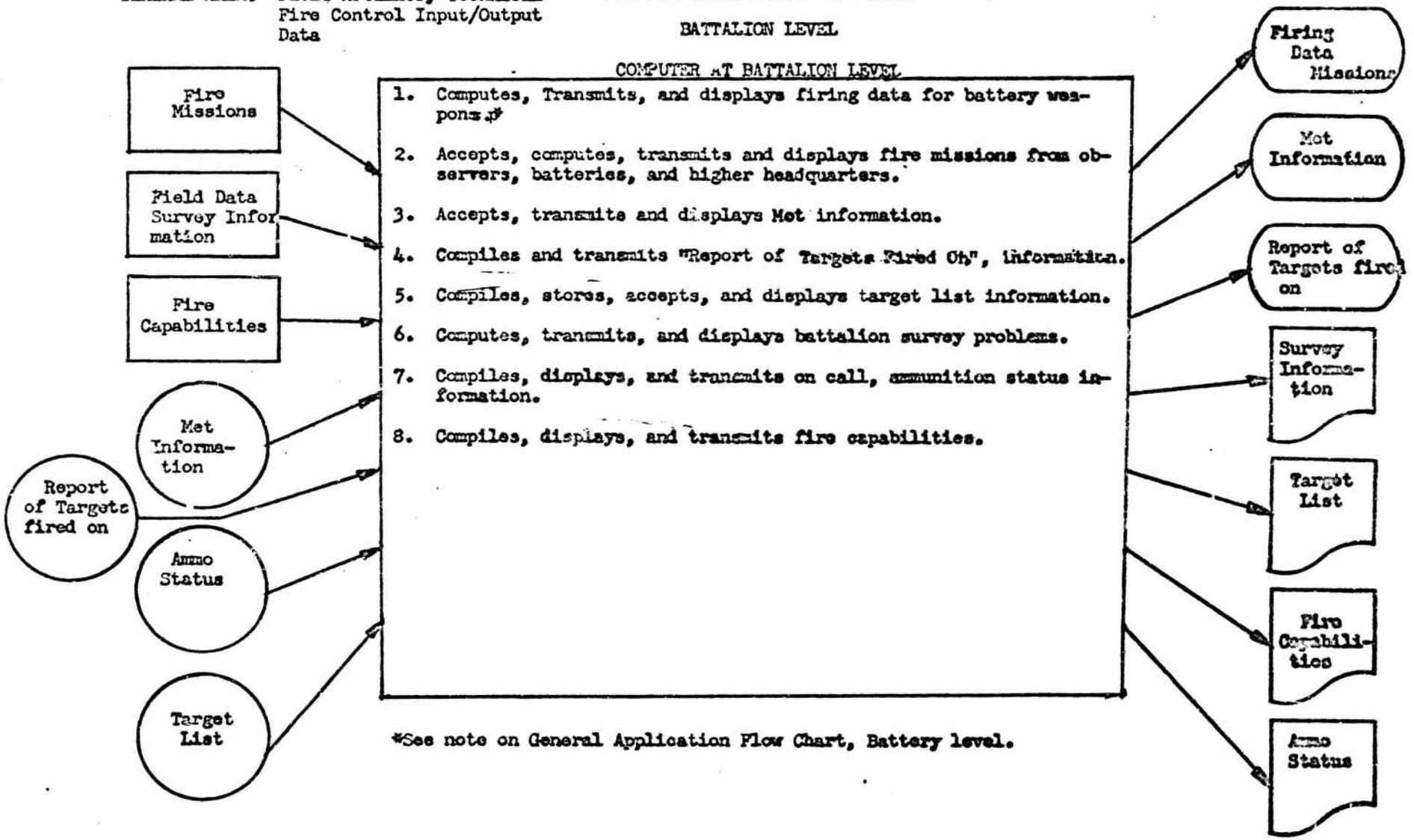


*This implies the computer will accept the necessary inputs to solve the ballistic problem. This problem is not the purpose of the study, therefore, only inputs and outputs considered suitable for ADPS transmission are listed.

GENERAL AREA: Field Artillery Technical Fire Control Input/Output Data

GENERAL APPLICATION FLOW CHART

BATTALION LEVEL



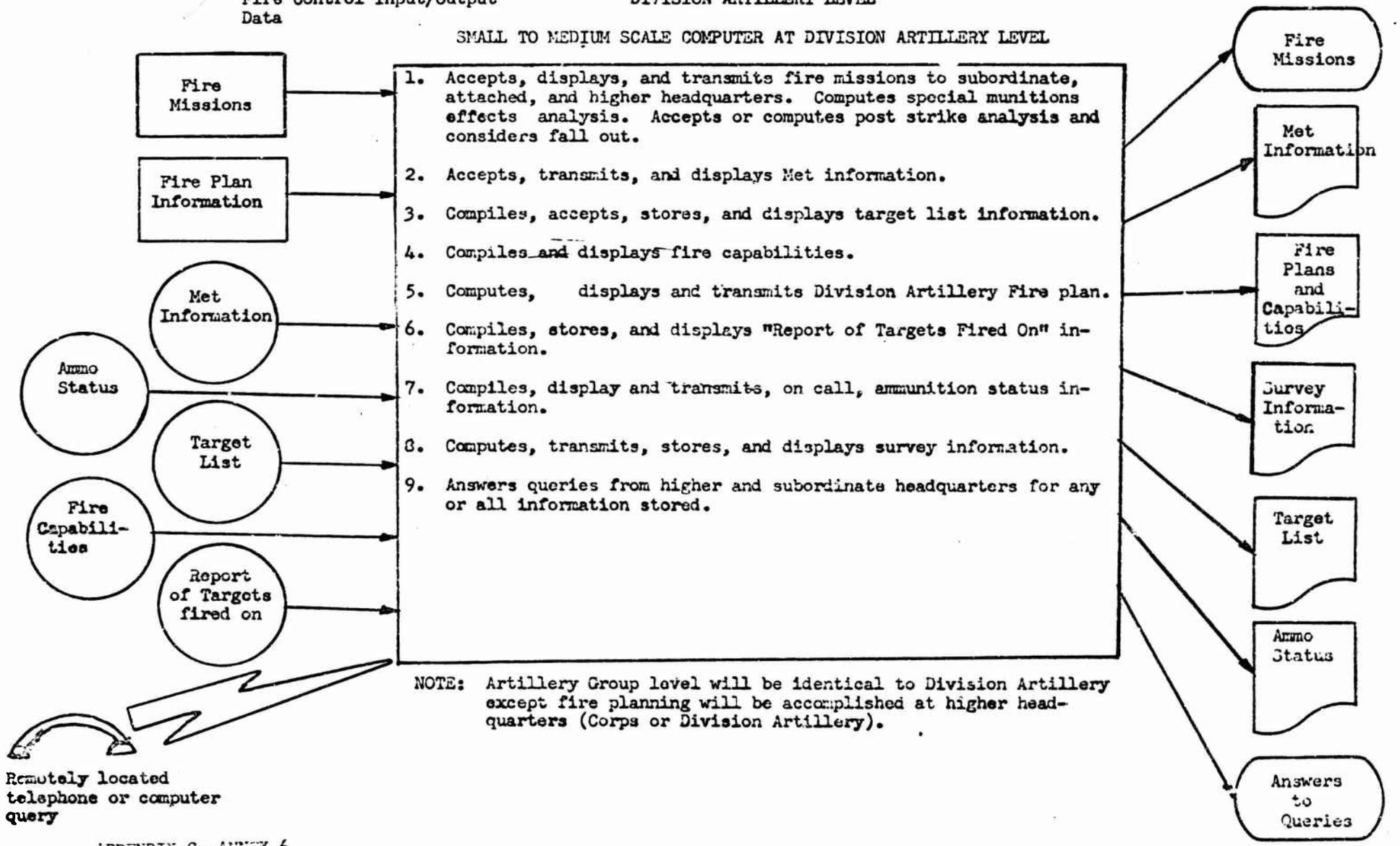
*See note on General Application Flow Chart, Battery level.

GENERAL APPLICATION FLOW CHART

GENERAL AREA: Field Artillery Technical
Fire Control Input/Output
Data

DIVISION ARTILLERY LEVEL

SMALL TO MEDIUM SCALE COMPUTER AT DIVISION ARTILLERY LEVEL

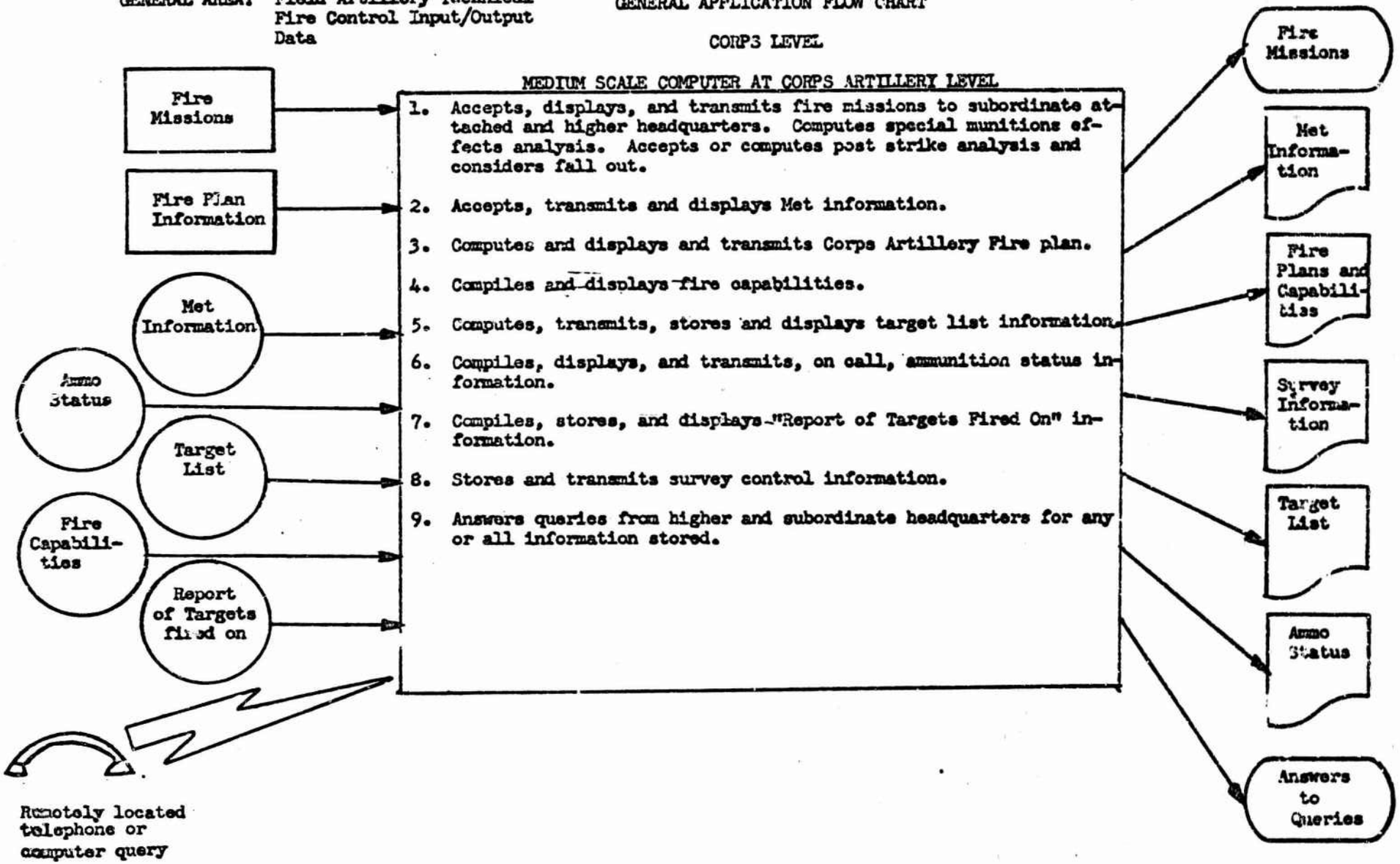


NOTE: Artillery Group level will be identical to Division Artillery except fire planning will be accomplished at higher headquarters (Corps or Division Artillery).

GENERAL AREA: Field Artillery Technical Fire Control Input/Output Data

GENERAL APPLICATION FLOW CHART

CORPS LEVEL

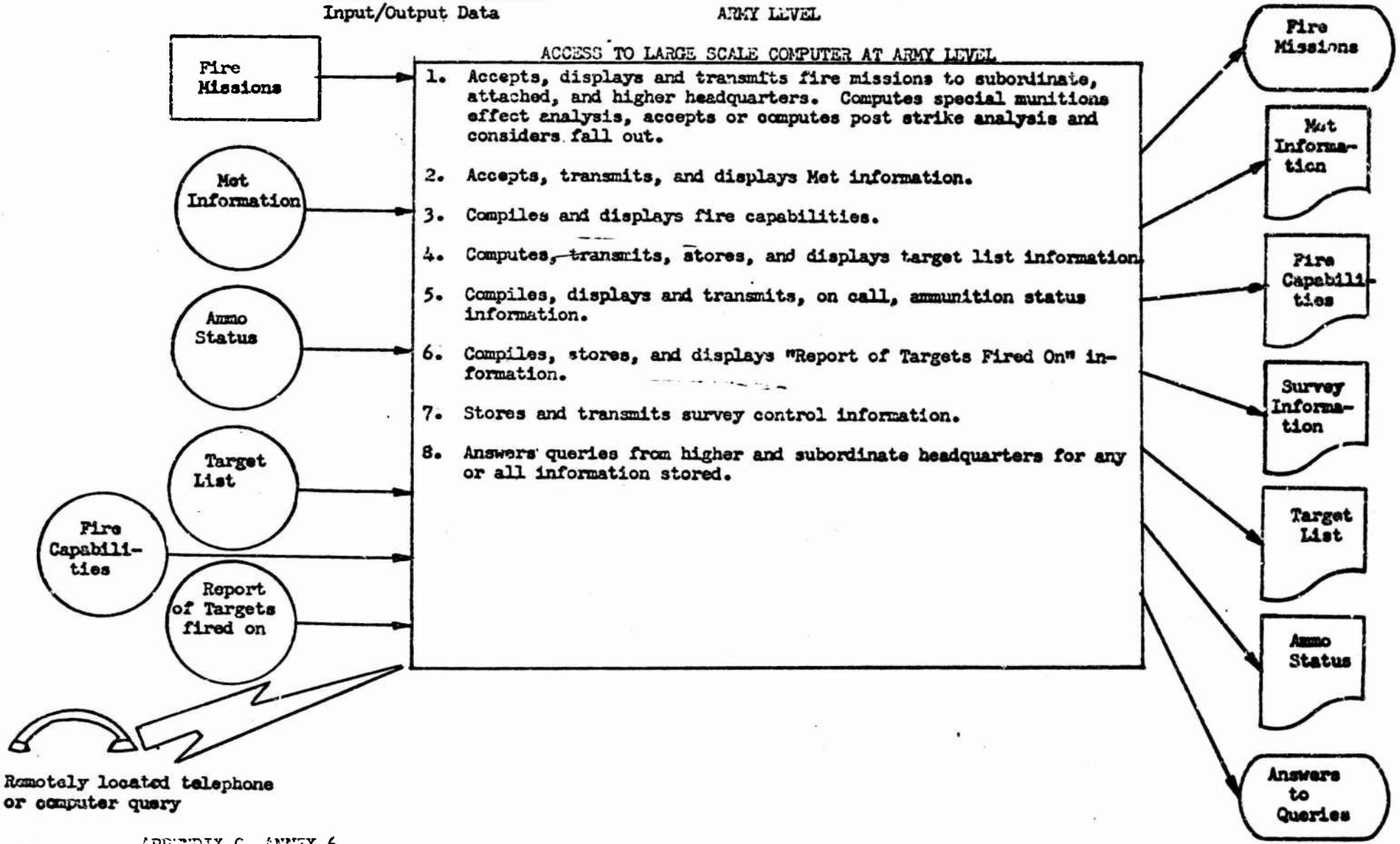


APPENDIX C, ANNEX 6

GENERAL AREA: Field Artillery
Technical Fire Control
Input/Output Data

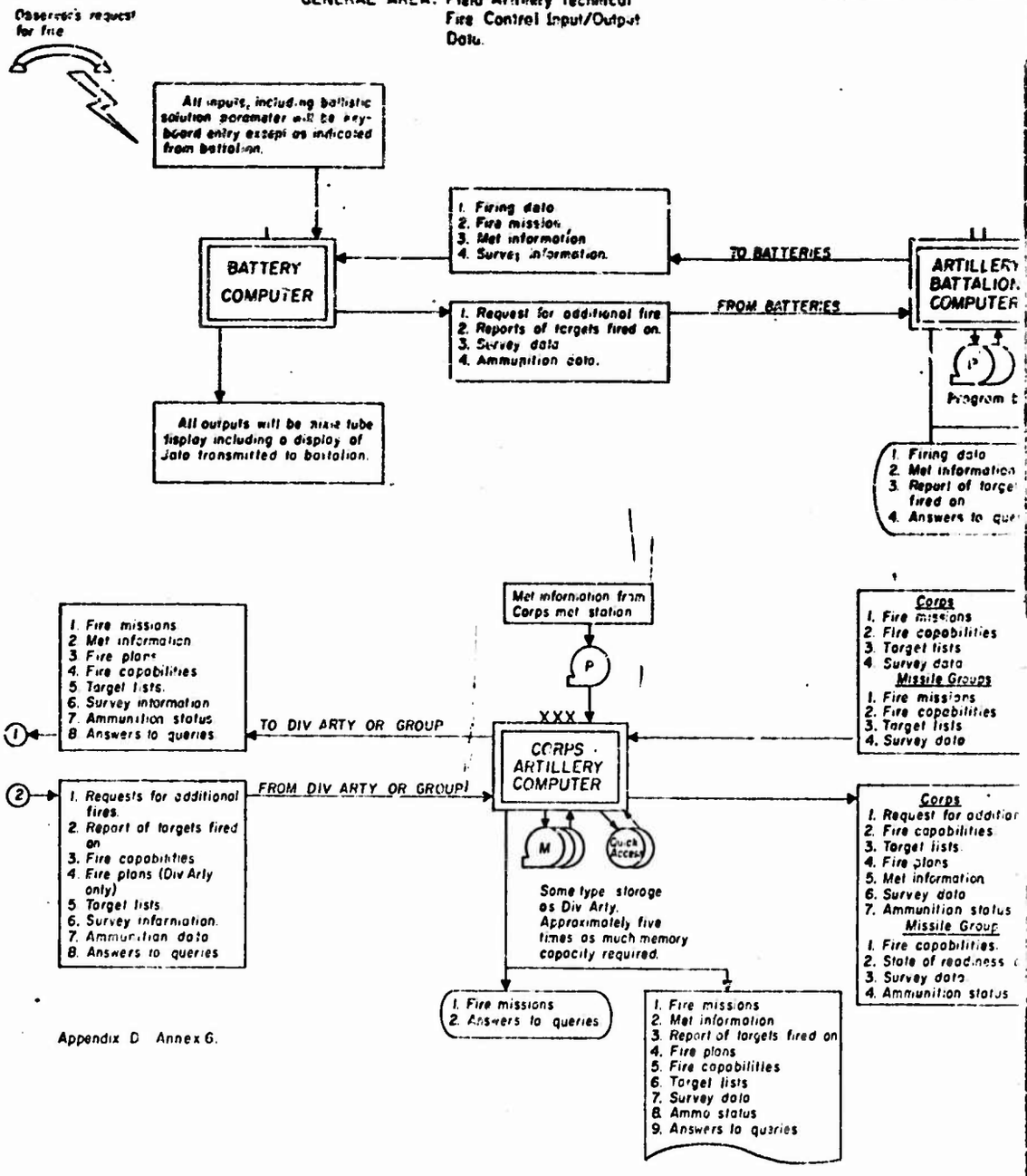
GENERAL APPLICATION FLOW CHART

ARMY LEVEL



MASTER LOGIC

GENERAL AREA: Field Artillery Technical Fire Control Input/Output Data.



Appendix D Annex 6.

NOTES:

1. NO ATTEMPT HAS BEEN MADE PROBLEM AS APPLIED TO FIR ONE OF INFORMATION STORA

2. FOR ILLUSTRATIVE PURPOSE EACH ECHELON, IT IS QUITE SEPARATE COMPUTERS WILL FUNCTIONS. THIS CAN BE DE ARE CONDUCTED. THE IMPO DEPENDENT ON THESE FUNC

3. DETAILED FLOW CHARTS ARE

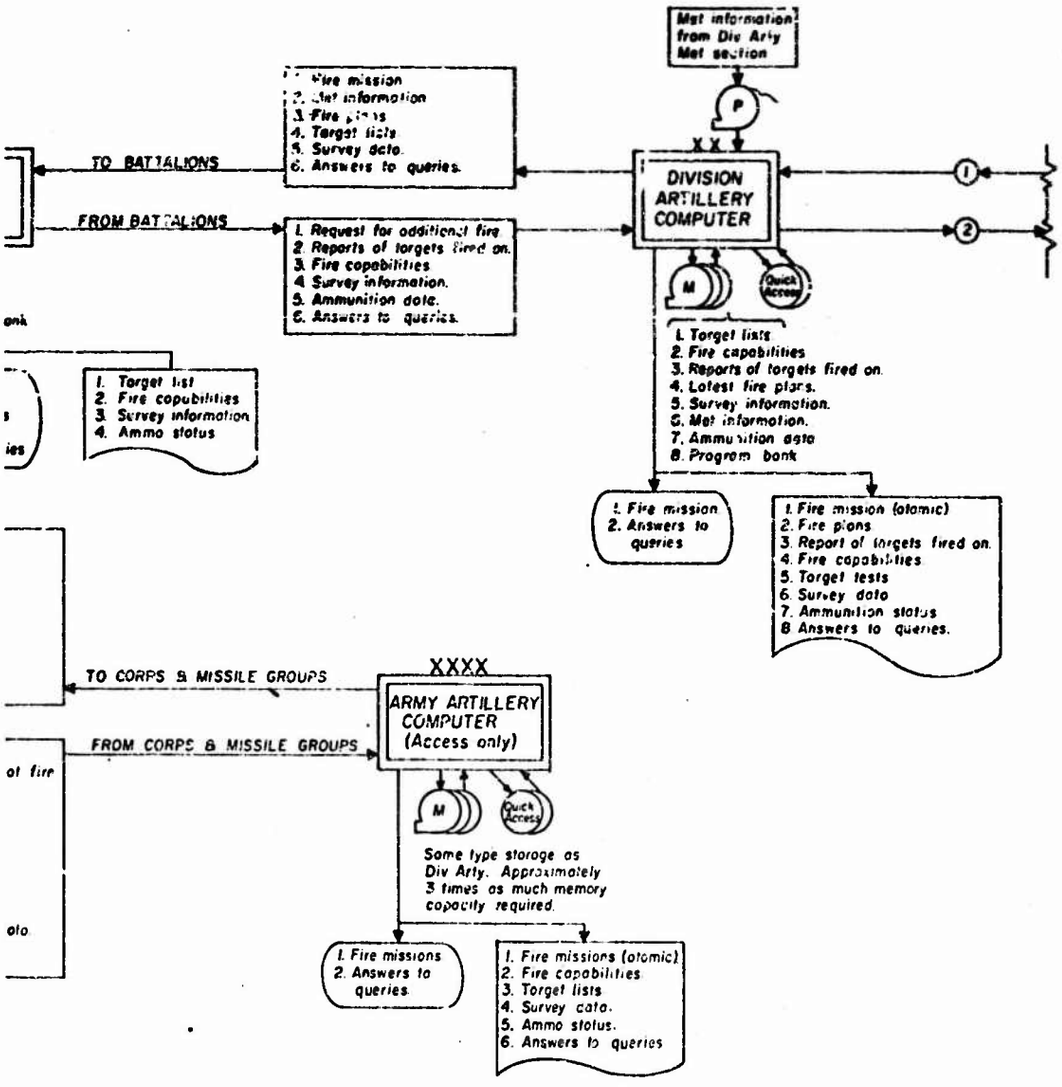
A. USAAMS PROJECT

B. USAAMS PROJECT

C. USAAMS PROJECT

D. WEAPON SYSTEM THROUGH USAAM

.. FLOW CHART



E TO SHOW DETAILED PROGRAMMING STEPS.
IE CONTROL INPUT OUTPUT DATA IS LARGELY
GE AND RETRIEVAL.

S ONLY, ONE COMPUTER HAS BEEN SHOWN AT
POSSIBLE THAT ABOVE BATALLION LEVEL,
BE NEEDED FOR THE SURVEY AND FIRE PLAN
TERMINED WHEN DETAILED SYSTEMS TESTS
RTANT POINT IS THAT FIRE CONTPOL IS
TIONS FOR INPUTS.

AVAILABLE AS FOLLOWS:

58-2, APPLICATION OF ADPS TO TACTICAL AMMUNITION STATUS REPORTING.

58-3, APPLICATION OF ADPS TO ARTILLERY CAPABILITIES COMPUTATION

58-5, APPLICATION OF ADPS TO FIELD ARTILLERY SURVEY

IGITAL COMPUTER PROGRAMS, AND FLOW CHARTS
OR FRANKFORD ARSENAL.